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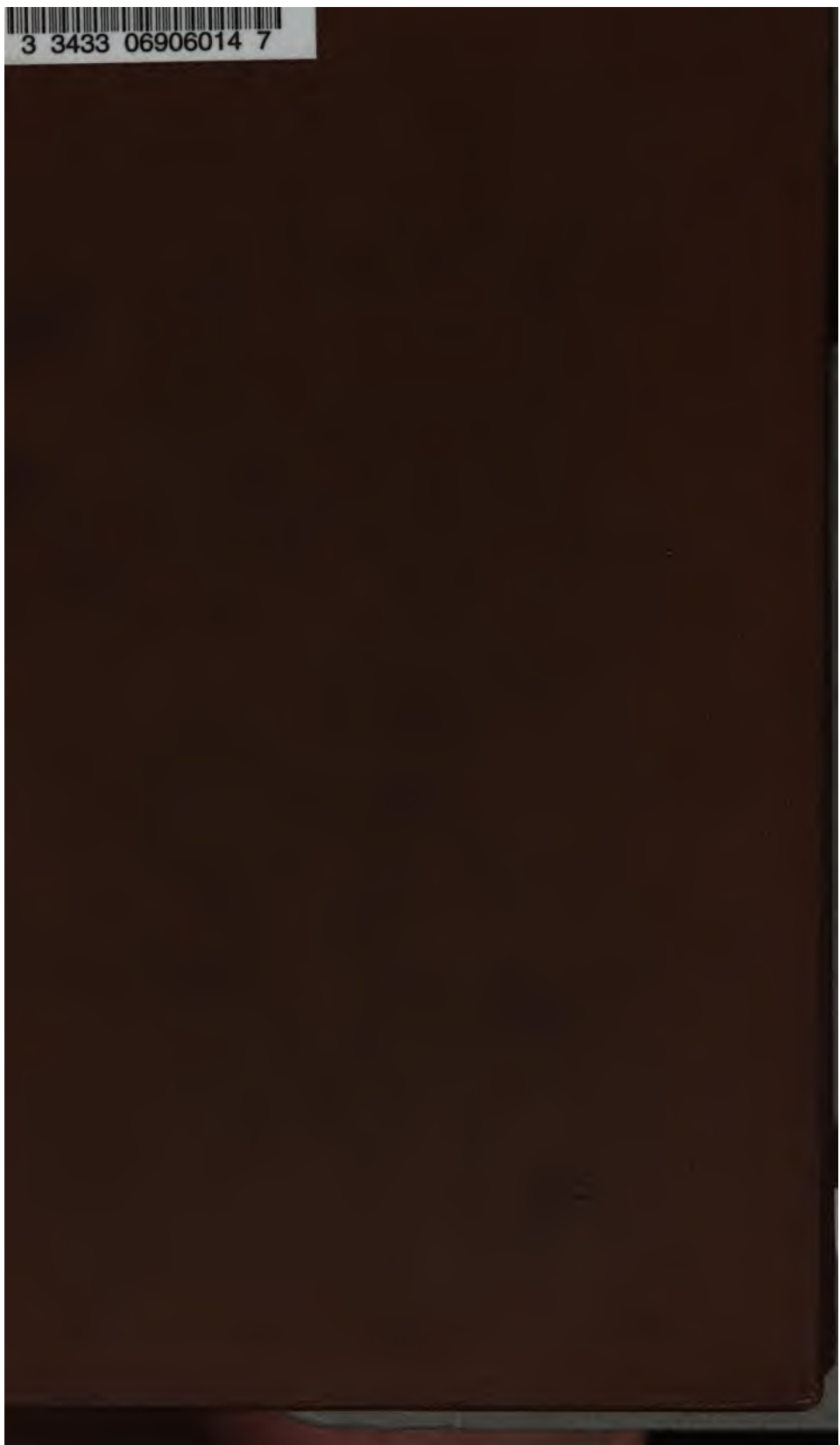
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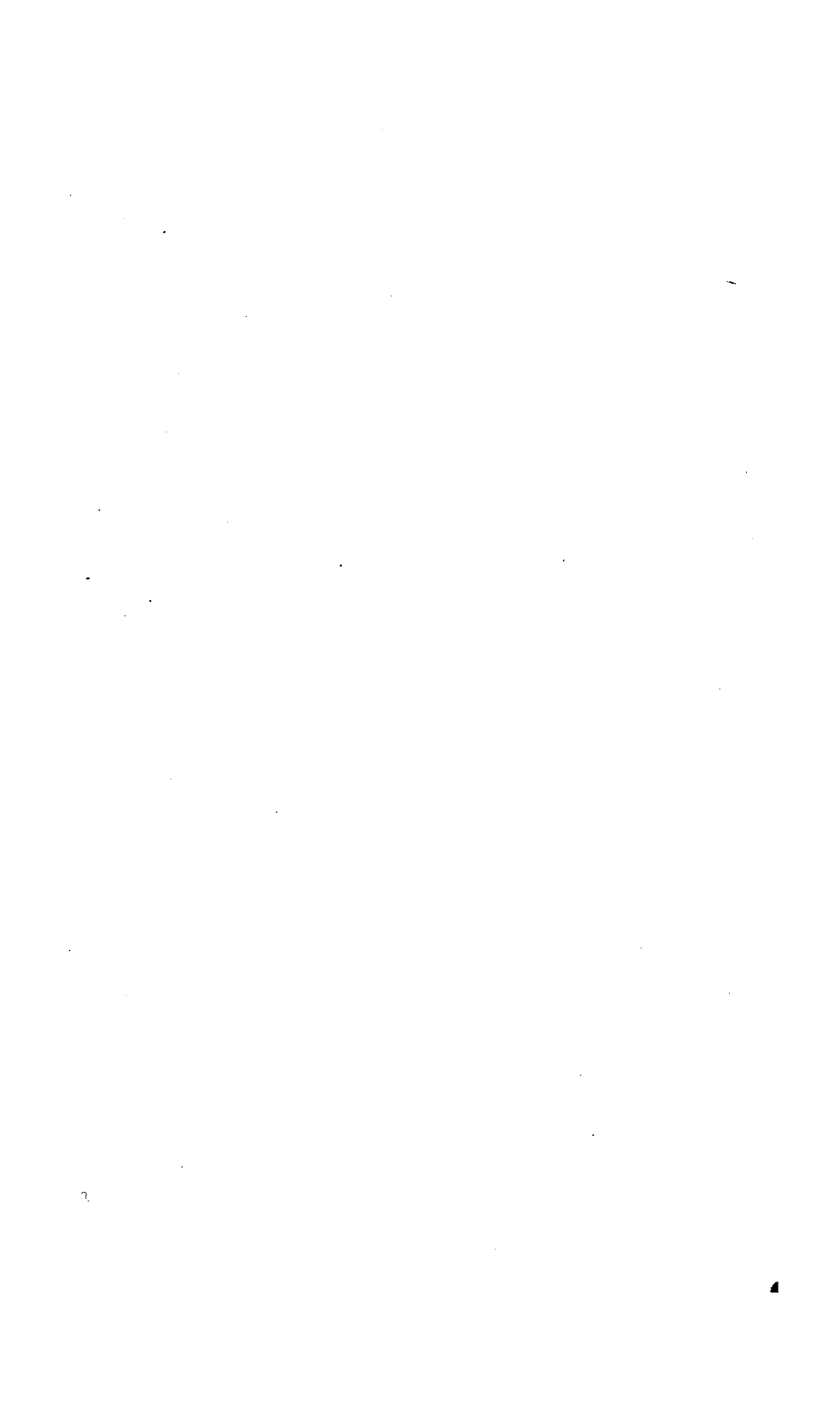
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Mining
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X

THE
MINING AND SMELTING
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A MONTHLY REVIEW OF
MINING, QUARRYING, AND METALLURGY,

WITH THEIR

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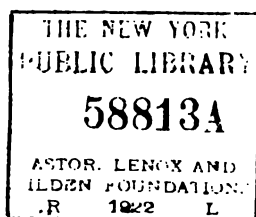
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 II. New Continuous Jigging Machine of the Upper Harz.
 III. Mechanical Puddler fitted to a simple Furnace.
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THE

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On the Method of Working the Calamine Deposit of
Altenberg, near Aix-la-Chapelle.

BY WILHELM JUNG, OF BONN.*

ABOUT a mile from Aix-la-Chapelle, on the road to Liège, lies the strip of neutral territory, comprising about 840 acres, that separates the Prussian and Belgian states. On this territory is situated the neutral village of Moresnet (formerly Kelmis), in the immediate neighbourhood of which the famous calamine deposit of Altenberg crops out to the surface. A short description of this, and the other ore-deposits of the Altenberg mining field which extends into both the Prussian and Belgian territories, was published, illustrated by several plates, by Max Braun, in the *Zeitschrift der deutschen geologischen Gesellschaft* for 1857.

This deposit crops out in the middle of the Devonian dolomite trough of Altenberg, in which it forms a mass of great longitudinal extent, but of very variable (although often considerable) thickness, and irregular form. The deposit ranges, like the dolomite trough, from N.E. to S.W., shooting like it also from N.E. to S.W., at an angle of from 10° to 20° from the horizon, and cutting out, almost vertically, at the S.W., as far as at present opened on, that is the 65-metre (35½-fm.) level. In its upper portions this deposit has a length of 440 metres (240 fms.), with a maximum thickness of 90 metres (47 fms.) in its N.E. portion. In consequence of a mass of dolomite being interposed at the surface, across this deposit, about the middle of its longitudinal extension, the calamine crops out to the surface in two distinct parts, which do not unite until the depth of 26 metres (14 fms.), where the mass of interposed dolomite wedges out. This division and the very different appearances of the N.E. and S.W. portions of the deposit, have caused the former to be

* *Berg- und Hütten. Zeit.* Nr. 39, 1863.

termed the north and the latter the south bed. The south-western extension, or the so-called south bed, which at its outcrop has a thickness of about 20 metres (11 fms.), is much the smaller, and is characterised by a mass of yellow and red clay, which lies principally on its south-eastern side for a length of 140 metres (76 fms.), and only dies out at a depth of 63 metres (34 fms.).

In consequence of the deposit shooting towards the S.W., the thicker (N.E.) portion does not extend to any considerable depth; and consequently the longitudinal extent and the thickness decrease as the depth increases, so that at the present deepest level, 65 metres (35½ fms.), the thickness is only from 20 to 40 metres (11 to 22 fms.). The trough-like form of the deposit on the N.E. becomes lost towards the S.W. and the south bed, in consequence of the interposing mass of dolomite, and gradually passes into two parts, which further on towards the S.W. unite into one, dipping from 50° to 60° towards the S.E.

The deposit consists essentially of an intimate mixture of silicate and carbonate of zinc, but stones of willemite occur more or less frequently. Nodules of ferruginous clay, corresponding to the yellow and red clay above referred to, in connection with the south bed, are also met with in the calamine. The upper portions of the deposit are often decomposed and soft, but in depth it becomes more compact, and is then only found to be disintegrated towards its outer limits. The masses of dolomite, either enclosed in the calamine or penetrating into it, show considerable disintegration, being sometimes completely decomposed; but this condition is principally observed near the surface, disappearing gradually in depth.

At the outcrop of this deposit, surface workings were carried on some centuries ago, but not to any great extent in consequence of the trifling application of zinc at that period. It has only been during the present century that the increasing demand for calamine has led to operations being carried on to such an extent as to cause the N.E. portion of the deposit (the so-called north bed) to be worked for a length of 280 metres (153 fms.) to its cutting out in depth. As the deposit shoots S.W. at an angle of from 10° to 20° from its N.E. outcrop, this last-named working reaches a depth of 80 metres (43½ fms.) at the south-western stope, and furnishes at its maximum thickness of 90 metres (47 fms.) a very considerable quantity of calamine. In the S.W. portion of the deposit (the so-called south bed), as the calamine only cropped out thin and buncy, the surface workings were necessarily unimportant, so that when the openwork operations on the N.E. portion came to an end, it became necessary to resort to underground workings.

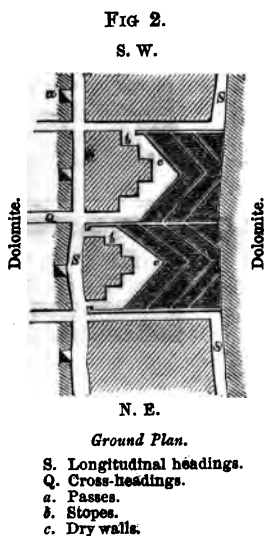
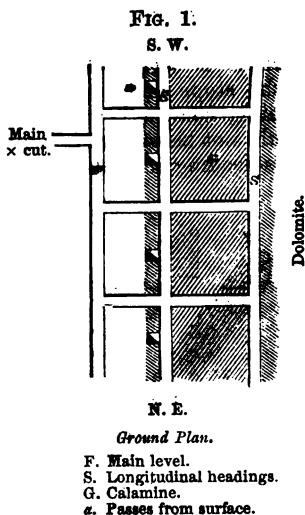
With this object, the two Mosselman shafts, Louise's shaft, von Dechen's shaft, &c., were sunk in the country, in the so-called roof or hanging wall, to the S.E. of the deposit, from which it was worked, by means of a water-pressure engine and a steam-engine for winding and pumping, at the 36-metre (19½-fm.) and 52-metre (28½-fm.) levels, for a length of 180 metres (98½ fms.) to its point of cutting out vertically towards the S.W., until some pillars only were left over the 52-metre level. These engines are at present

removed, and the shafts—with the exception of Louise's—filled up: the deposit, so far as known, does not appear ever to have been opened up by levels.

In 1857, in order to open up the deposit in depth, the sinking of two vertical shafts in the country, or so-called roof or hanging wall, was commenced—the elliptical engine-shaft, Le Hon, 5 metres ($16\frac{1}{2}$ ft.) long by 4 metres (13 ft.) wide, sunk to a depth of 90 metres (49 fms.); and the rectangular foot-way and drawing-shaft, Perrier, 4 metres (13 ft.) long by 2 metres ($6\frac{1}{2}$ ft.) wide, sunk to a depth of 64 metres (35 fms.). These shafts are only 8 metres (26 ft.) apart, and the one engine-house is common to both—the engines in which are $6\frac{1}{2}$ metres (21 ft.) above the level of the burrow. At a depth of 65 metres ($35\frac{1}{2}$ fms.) there is main cross-cut (see Fig. 1) from these shafts, which is driven to a point in the close vicinity of the deposit; from which point a main level is driven in the country longitudinally, N.E. and S.W., parallel with the strike of the deposit. From this, cross-headings are driven across the calamine to the opposite wall, which divide up the deposit into 5 pillars of from 20 metres (11 fms.) to 40 metres (22 fms.) wide. From these cross-headings, longitudinal headings are driven in the calamine on both walls—thus connecting the cross-headings together.*

Several small shafts or main passes are sunk for the objects pointed out further on, from the surface to the 52-metre level; below which, to the 65-metre level, there is a pass (*a* in Fig. 1) sunk in the roof or hanging wall for each pillar.

The taking away of the pillars thus laid open is effected by working upwards in the following manner, from the headings described, in stages each of 2 metres ($6\frac{1}{2}$ ft.) high. From the corner of both the cross-headings bounding the pillar at their point of junction with the longitudinal heading driven on the floor or foot-wall (see Fig. 2), a stope is commenced 2 metres ($6\frac{1}{2}$ ft.) high and $1\frac{1}{2}$ metres (5 ft.) wide, and carried in the direction of the strike of the deposit,



* The main level, the cross-headings, and the longitudinal headings, are all driven 2 metres ($6\frac{1}{2}$ ft.) high by $1\frac{1}{2}$ metres (5 ft.) wide.

and parallel to the longitudinal headings. When this stope has advanced 3 metres (10 ft.), it is followed by a second, and that at a like distance by a third, and so on. As soon as the second stope has advanced 2 metres ($6\frac{1}{2}$ ft.), the space worked away must be completely filled up with deads. To this end, a dry wall, *c, c*, of dolomite is carried to the roof, with a direction diagonal to that of the stope and the space behind it, including the longitudinal heading, compactly filled with deads. If the neighbouring pillar should not be worked out simultaneously, a wall is carried along the cross-heading in order to secure its being kept open. When the

stopes are advanced 3 metres (10 ft.), another wall is carried $1\frac{1}{2}$ metres (5 ft.) from the first wall, and parallel to it, the space between the two being also filled up with deads. In this manner the workings are compactly filled up as the ground is taken away; and to save time, the ground is worked away by day, and the workings filled up by night. In order to keep open the main longitudinal heading driven on the roof, or hanging wall, another dry wall is built parallel to the strike on the north-west side of the heading towards the stope. If the roof is very tender, the last dry wall, *c, c*, is supported by a range of poles (*d*, Fig. 3) 2 metres ($6\frac{1}{2}$ ft.) long, which however are taken away when the space between that and the succeeding wall is filled up, and used again.

When one stage of a pillar (2 metres— $6\frac{1}{2}$ ft.—high) has been thus taken away, in order to take away the succeeding one, a rise 2 metres ($6\frac{1}{2}$ ft.) high (*e*, Fig. 4) is put up at the end of the cross-heading, but wholly in the country. From this rise another cross-heading is driven through the deposit, from which longitudinal headings (*f*) are extended on both walls. In proportion as that driven on the roof or hanging-wall is extended, the open main-heading beneath it of the first stage is compactly filled up with deads. In this second stage the calamine is worked away in a similar manner as in the first,

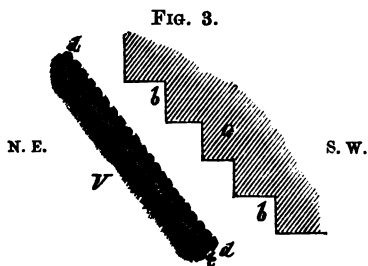


FIG. 3.

Ground Plan.

- V. Workings filled up.
- G. Calamine.
- b. Stopes.
- c. Dry wall.
- d. Range of Poles.

is very tender, the last dry wall, *c, c*, is supported by a range of poles (*d*, Fig. 3) 2 metres ($6\frac{1}{2}$ ft.) long, which however are taken away when the space between that

and the succeeding wall is filled up, and used again.

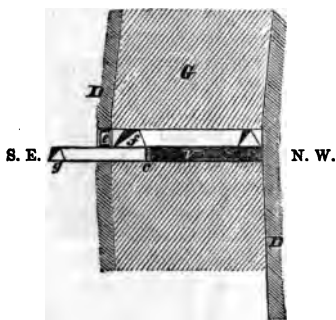


FIG. 4.

Transverse Section.

- D. Dolomite.
- V. Heading filled up.
- G. Calamine.
- c. Retaining wall.
- e. Rise.
- f. Longitudinal headings.
- g. Main level.

and so on in the 3rd and 4th, and upwards; the rise being continually carried higher, and cased into two divisions—one for a foot-

way, and the other as a pass for the calamine—until the main level above, over which the ore has been already taken away, is reached.

Each stage must, however, be kept in connection with the pass from surface, which result is arrived at by removing the timber on one side of the pass, and putting in its stead a frame; which frame is removed, and again replaced by timbering, when the stage is abandoned—to be re-used in the next stage in a similar manner.

In working away the uppermost stage of a series, and thus coming to the "old men's" workings, great care has to be taken that the old workings filled up are not broken into. To avoid this danger, the roof is securely timbered in the manner shown in Fig. 5—a portion of which timbering, however, is removed as the workings progress. At the 65-metre level, in order to give greater security to any subsequent workings from a level beneath, the deads are filled in on a stull of fir-timbers 20 ft. long; which secures these working from the danger of falling in on any new workings from a lower level, unless the timbers should decay in the mean time.

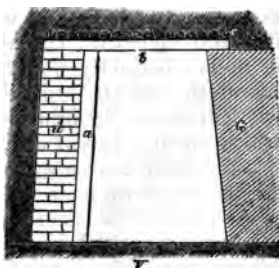
In this manner, the calamine deposit, after being opened out in pillars, is worked away in six or seven stages, each 2 metres ($6\frac{1}{2}$ ft.) high. This would show for the 13 metres (17 fms.) from the 65-metre level to the 52-metre level six stages of 2 metres each ($6\frac{1}{2}$ ft.), and leave only 1 metre ($3\frac{1}{4}$ ft.) for the seventh stage. As however the 2 metres is calculated on the height of timbering, which sinks somewhat into the deads in the second and following stages, the real height of each stage is less than 2 metres ($6\frac{1}{2}$ ft.), and consequently the upper one has as great a height as the lower ones.

This method of working—by packing the openings with deads secured between diagonal walls—has many advantages. Each pillar being attacked from two sides, the stopes are kept of a moderate length; while the diagonal walls allow of the ground worked away being filled up as quickly, and as close to the stopes, as the convenient removal of the ore renders advisable.

The deads required for filling up are quarried at the outcrop of the south bed, and are sent down to the 52-metre level by the passes opening to the surface near where they are broken. From the 52 they are sent to the 65-metre level, and the various stages at which they may be required, through the other passes described. In the quarrying of these deads, the thin and buncy bed of calamine, which, as stated, characterises the outcrop of the south bed, is also worked.

The calamine and the country are generally very compact, particularly at the present depth of working. It is only at special points that the calamine and country become soft, so that the ground generally requires to be blasted. The pick is of subordinato importance; and the use of the mallet and gad is unknown.

FIG. 5.



Cross Section.

V. Workings filled up.

G. Calamine.

a. } Timbering.

b. }
c. } Dry wall.

d. } Dry wall.

The System of Selling Tin-Ore in Cornwall.

IN our last number we referred, under a local heading, to the system pursued in Cornwall of selling black-tin by private contract. We stated that, in our opinion, such a system—which left the supply of tin to the smelters a patronage in the hands of the pursers of mines—was “wholly indefensible, and must sooner or later be abandoned for an open ticketing.” As this view has been taken exception to, we feel it necessary to give our reasons in support of it at some length. In any statements we make in doing so, we wish it to be distinctly understood that we mean to cast no personal imputation on any individual. We merely object to a *system*, which we believe to be injurious and thoroughly indefensible—and one which, in the present day, is an obvious commercial anachronism.

We need scarcely remind our readers that, as a rule, the ores of all the more valuable metals—such as copper, lead, zinc, and even silver—raised in this country are sold at “ticketings” (which are a species of auction), or by tenders made by the smelters on samples sent to them by the miners. The only exception to this rule is in the case of tin-ore, which is carried *in bulk* to the smelting-house—*before any sample has been taken, any assay tried, or any bargain made*—and then and there sampled, assayed, and sold.

The price at which such tin-ore is sold has hitherto been theoretically deduced from the “standards” fixed by the smelters—which standards we give monthly under our Metallic Ore Markets—according to a certain scale of deductions and returning charges, which we described two years ago.* We say “theoretically,” for

* “The mode of estimating the money value per ton of black tin from the ‘standard’ is very simple. The first step is to find the ‘produce,’ which is estimated at so much in 20. This is done by trying a sample of 1 ounce = 20 dwts. in a crucible with a proper mixture of anthracite (generally about 5 dwts.) for reducing the oxide, and sometimes a certain proportion of borax for flux. The weight in dwts. of the button resulting from this assay is the ‘produce’ of the sample—let us say 13½ in 20 (which equals 68½ per cent.). From this ‘produce’ of 13½, a fixed deduction (which remains the same whatever the produce may be) of 1½ is made for ‘returning charges,’ which reduces the ‘nett produce’ to 12½. The ‘quality’ of the metallic tin is next examined into, and its class is fixed as ‘common’ or ‘fine,’ as the case may be. A ‘standard’ being fixed periodically by the smelters for each of these qualities, the money value is found by multiplying the standard by the nett produce and dividing by 20. For example, let us take the instance assumed above of a produce of 13½, and let us suppose that the quality of the tin was ‘common.’ We then have 13½, less 1½ (for retaining charges), giving the nett produce as 12½. At the time we write the standard of ‘common’ tin is 109½, to which, if we apply the above rule, we have—

$$\frac{£109 \times 12\frac{1}{2}}{20} = £68 \text{ 2s. 6d., value per ton of the black tin.}$$

Besides the allowance of 1½ for ‘returning charges,’ the smelter also receives an allowance of 3 lbs. per cwt. for ‘wastage;’ the black tin being weighed off at 115 lbs. to the cwt., or 20 cwt. 2 qrs. 4 lbs. to the ton.”—*Mining and Smelting Magazine*, No. 1, January, 1862.

we need scarcely point out to any man of business that no pre-arrangement of rates can possibly force every buyer to give the same price for any given article: indeed as a matter of fact it is notorious that at times the black-tin from one mine has fetched considerably more at one house than at another, and *vice versé*; and we say "hitherto," for recently there have been no certain settled standards, for reasons we may have to refer to on a future occasion.

In the whole circle of commerce we are aware of no other article which is carried in bulk to a consumer—without any previous sample being sent or bargain made, or even without any knowledge whether he particularly wants that special article or not—to be then and there sold according to a certain theoretical trade scale. On the face of it, such a practice is so astonishing that it naturally suggests an enquiry as to how such an anomalous state of things ever originated. The explanation is very simple, but in order to understand it it is necessary to refer back to the arrangements in vogue under the old "coinage" system.

Formerly all tin raised in Cornwall had to be "coined" by the officers of the Duchy before it could be sold. There were four coinages a year, at certain "coinage towns," when the blocks of tin were brought into a coinage hall to be tested as to quality, which being found satisfactory the blocks were stamped with the Duchy Seal permitting the owner to sell.

Under this system it had never been the custom for the smelter to *buy* the black-tin, or tin-ore, from the miner; for to buy an article, very fluctuating in price, which could not possibly be sold for three months would evidently have been a highly speculative business. The miner merely took his ore to the smelting-house to be converted into metal, for which the smelter levied, not a money payment, but a certain toll in kind. Before the miner left the ore for this purpose, an assay was made between the parties, and a receipt or warrant given by the smelter for so much metallic tin (being the estimated yield of the ore less the stipulated toll or "returning charges") to be delivered at the next coinage. Taking the case of a parcel of say $10\frac{1}{2}$ tons black-tin of a produce of $12\frac{1}{2}$ in 20; and supposing the toll or "returning charges" agreed on to be $1\frac{1}{4}$ in 20, the nett produce would be $11\frac{1}{4}$. At $11\frac{1}{4}$ in 20, the yield of the $10\frac{1}{2}$ tons of black-tin would be 6 tons 8 cwt. 0 qrs. 14 lbs. of white, or metallic-tin; for which the smelter gave a warrant, or "tin-bill," in the following form:—

Truro, January 1st, 1802.

Received of Mr. A. B. Ten tons ten hundredweight of Black Tin, which at eleven and a quarter for twenty in White Tin is six tons eight hundredweight and fourteen pounds. Which I promise to deliver to him or bearer this Truro coinage.

For C. D. & Co.

E. F.

White Tin, 6 tons 8 cwt. 0 qrs. 14 lbs.

This "tin-bill" was, by custom, negociable by endorsement the same as a bill of exchange; and as miners were usually in want of money we need scarcely say that it was generally converted by them into cash before the coinages. Indeed, if the miner were even in a position to wait for the time of coinage, it is evident that there

would be an immense difficulty for numerous small holders of metallic tin to sell their produce satisfactorily. Consequently the bills passed by sale or discount—the latter being a kind of conditional sale depending on the price of tin after the coinage—into the hands of capitalists of various descriptions; in early times to merchants or bankers, but more recently to the tin-smelters themselves. Indeed during the later years of the coinage system the smelters became the most general purchasers of their own bills, for—instead of being, as originally, very small people reducing the miners' black-tin to a metallic state for a moderate toll—they had gradually developed into capitalists and succeeded in getting the trade of the metal into their own hands. In theory they took the ore to reduce to metal on toll, giving a receipt or warrant for the produce; but as they usually bought back this warrant or "tin-bill" from the miner, the transaction practically amounted to buying the ore by a roundabout process.

Under these old conditions it is evident that it was not in the least material to the miner to what smelting-house he took his ores. Provided the assays were similarly made, and the returning charges equal (which were the case everywhere), he got a bill for the same quantity of white tin whether he carried his ore to Carvedras or to Chyandour. The dealing with this bill or warrant was a subsequent matter, in which he took care no doubt to bring it to the best market. In fact it mattered as little to him to what house he took his black tin as it would to a London merchant whether he had a warrant for produce stored in the London Docks or the West India Docks. The tin-ore was carried to the smelting-house for the purpose of *conversion* and *deposit*, and not for the purpose of *sale*; and consequently the bringing of it in bulk, and without previous arrangement, was perfectly natural and reasonable—as was also the feeling that the selection of the house was a patronage of the pursers. All assayed similarly; all charged the same toll or "returning charges;" and the bills or warrants of all were equally good.

When, however, the system of coinage was abolished, and the smelters universally came to buy the black-tin for money from the miners, the old arrangements should have been at once modified in accordance with the ordinary practices of commercial affairs, and those adopted for the sale of all other metallic ores. But instead of this the ancient routine—reasonable enough in its origin, but in the present day an absurd anachronism—has been doggedly persevered in, and even defended by certain excuses—we cannot call them reasons—which we shall now proceed to examine. We do so, not because we think it necessary, for we deem it sufficient to state the anomalous system existing, and throw upon those who justify it the *onus* of showing why that which would be considered intolerable in the case of all other metallic ores is proper in the case of tin;—why it is right to sell copper and lead ores by competition, and "highly unadvisable" to do the same with tin ores;—but in order to be done with the matter once for all, for we know that otherwise these old excuses will again be set up to refute us.

I. In the first place it is said—The tin smelters are among the leading people in the county in position and honour, and it is a

gratuitous and impertinent presumption to assume that firms of such position would take advantage of miners carrying tin to their smelting-houses by offering a price lower than they would give under any other circumstances—for instance at a ticketing. Without discussing whether this is good business or not, we are ready to assume, for the sake of argument, that *every* tin-smelting firm in Cornwall has *always* given as much for tin brought to its house for sale as it would have offered with the knowledge that other people were bidding against it. But even allowing this—and considering what human nature is, it is a very great allowance—we shall show the system to be still utterly indefensible.

No one who has ever looked over the ticketing papers of the Cornish or Swansea copper ore sales, or of the Holywell lead ore sales, or a return of the tenders made by the various lead-smelters for parcels of lead ore of which they had received samples, can have failed to remark a very wide disparity in the bids—sometimes even in those of the largest houses. Now what does this show? Because Messrs. Newton, Keates, and Co. happen to have bid 10s. per ton more for a certain parcel of lead ore than Messrs. Walker, Parker, and Co., is it necessary to assume that the one firm gave too much, and the other offered too little? Nothing of the kind. It simply shows that Messrs. Newton, Keates, and Co. wanted that particular parcel of ore more than Messrs. Walker, Parker, and Co. did. And in what trade, we ask, does not this happen every hour? Assuming that this parcel of ore had been sent to Messrs. Walker, Parker, and Co. for sale by private contract—and it is by no means uncommon for parcels of lead ore under special circumstances to be so sent to that and other large firms;—and also assuming that under such circumstances that eminent firm would have given (as is no doubt their custom) just the same price as they would have offered by ticket or tender, would not the miner still have got 10s. per ton less for his ore than it was worth the while of another firm to give? And this without benefit to any one, for while the miner is a loser the smelting-firm purchasing (assuming it gave as much as it could afford) is really no gainer—it being no advantage to it that the ore would have been worth more to another firm. Hence the most absolute conviction that any smelting-firm will give just as much for ores sent to it privately as it would bid by public competition, is no justification for following such a system as a rule—for it afford no security that a better price might not be had elsewhere.

So it is with copper, and indeed any other article of produce: the same article is not necessarily always worth the same price to all, and this is particularly the case with metallic ores, the metallurgy of which so much depends on a judicious mixture of various kinds. On any given week a certain parcel of copper ore may be really and truly worth much more to Messrs. Vivian and Sons than to Messrs. Williams, Foster, and Co., while the converse may be the case with another parcel. At the ticketing each firm bids as much as it can afford and each gets the parcel it requires, at the highest attainable price for the miner, but yet one the smelter can well afford to pay.

With tin these reasons are even still stronger, for in the case of

no other metal do the metallurgical operations depend so much upon a judicious mixture of the ores. Leaving aside this, the metallurgy of tin is mere child's play: the works are most inexpensive, the black tin scarcely costs more than 1*l.* per ton to reduce, and the metal can be in the market within a week from the purchase of the ore. All depends on mixing, so that at times a certain class of ore may be worth almost any price to a smelter.

II. The second excuse put forward is that there would be a difficulty in sampling ore of such a high money value per ton; and that consequently the smelters would be shy of bidding on samples supplied them from the mines without seeing the parcel in bulk. The best answer to this is that the smelters, even at present, continually do buy parcels of tin by sample from the Eastern mines, who usually sell their tin in this manner,—and that in the case of black tin of the very highest quality and price. There is no difficulty found in sampling the ores of other metals of an equal or greater value,—such for instance as the Ludcott silver ores, which were all tendered for from samples supplied from the mine. We cannot believe that the Cornish mine agents are incapable of sampling a parcel of tin, or that they cannot be relied on to do it fairly, particularly as there is an ample remedy for any unfairness committed. Besides, if it were indeed found to be impracticable to get the smelters to bid up to the mark on the faith of samples supplied by the agents, there would be no difficulty in the tin smelters doing as the copper smelters do, and having samplers of their own to go about to the different mines.

III. The third excuse set up is that, if a ticketing were established, it would only enable the smelters more effectually to combine together to lower the price of the ore. A fallacy of this kind scarcely deserves serious refutation, but it is curious that precisely the same objection was urged, upwards of a century ago, to the adoption of the system of competition for the sale of copper ores. At present the tin smelters, or their agents, meet weekly for the purpose of discussing and arranging prices, and it is difficult to see what more they could do under any system. We however are not particularly wedded to a ticketing—especially if it is to involve as much expense in eating and drinking as the Cornish copper-ore ticketings. The practice of private tender may be found preferable, as seems to be the case in the sale of lead ores, where this practice is every day extending. All we desire to see is the adoption of a system of fair competition in the sale of black-tin, similar to that which exists in the case of every other metallic ore.

It may be asked how it is that, in the face of such obvious objections, the present system should have been so long maintained, and be still persevered in. We could readily answer this question, and show exactly how the present system actually works, as well as those who are most interested in maintaining it. Whatever may have been the case in former years, we are strongly of opinion that, at present, the older and larger smelting houses would be rather benefited than otherwise by the sale of the ore being thrown open to competition. They must have seen of late that a certain class of persons possessed of interest in the share-dealing world—and conse-

quently with the power of bringing considerable pressure to bear on purgers and agents of mines—are in as good a position as they are to obtain a supply of black-tin; and that to hold their ground against this class, they must enter into the mining arena more than they have of late been accustomed to do. This alternative is so obviously distasteful that we can well imagine they would prefer abandoning the advantages (if any) of the present system, and relying on their superior metallurgical knowledge and business experience to maintain their position under a system of open competition. As to those who are really interested in maintaining the present system, and will fight hard for it, we may refer to them on a future occasion.

Abstracts and Reviews.

GLASGOW SCHOOL OF MINES.

The fourth annual examination of the students of this institution took place on November 18th, Mr. Fergusson, in the absence of the President, Mr. Merry, in the chair. The prizes were distributed as follows:—

1. Alex. Crawford, of Dreghorn, an improved compass for mineral surveying; presented by the President, Mr. James Merry, M.P.

2. Jas. Radcliffe, of Nitshill colliery, Renfrewshire, a brass parallel ruler; presented by the treasurer, Mr. Jas. Hunter, of the Coltness ironworks.

3. Wm. Williamson, of Govan colliery, Glasgow, a Biram's pocket anemometer; presented by Mr. Archibald Hood, of Whitehall and Lasswade collieries.

4. Robert Colquhoun, of Jordanhill colliery, Lanarkshire, three volumes of books (Johnston's Mechanical Drawing, Smiles' Self Help, and Smiles' Story of the Life of George Stephenson); presented by Mr. James Fergusson, of Auchinheath and Craignethan gas coal works.

5. Wm. Aitken, of Kenmuir colliery, Lanarkshire, three volumes of books (Hugh Miller's works); presented by Mr. Wm. Alexander, Government Inspector of Mines for the West of Scotland.

6. David Wingate, of Parkhead colliery, Motherwell, a clinometer; presented by Mr. John Galloway, of Barleith and Dollar collieries, Kilmarnock.

7. John M'Gowan, of the Possil colliery, Glasgow, a book (Hoskold's Mineral Surveying); presented by the teacher, Mr. Mark Fryar.

In the evening a soirée took place which was attended by a number of students both of the past and present years, and several gentlemen connected with mining operations, the object being to present a testimonial to Mr. Mark Fryar, as a token of esteem and a mark of his ability. The chair was occupied by Mr. Robert Hood, sen., of the Stoneleigh colliery, Glasgow, who, in the name of the students, presented Mr. Fryar with the following instruments:—Hedley's improved compass for mineral surveying, made by Davis, of Derby, inscribed "To Mark Fryar, M.E., F.G.S., &c., from the students of the Glasgow School of Mines. A token of esteem. Nov., 1863." A pocket aneroid barometer, bearing a like inscription; also a surveying chain and tape. The chairman hoped that these presents would pass from one generation to another as heirlooms in his family, proving to each individual member perpetual incentives to deeds of goodness and of wisdom.

In returning thanks Mr. Fryar stated that, although the School of Mines had only been in operation for four years, no fewer than 93 students had

studied in its classes during that time, and of these at least 22 were now actually engaged in the management of, or assisting the management of, mines; a number exclusive of some four or five others, who were engaged in such situations before coming to the school.

THE HARTLEY RELIEF FUND.

The apportionment of the surplus of the magnificent sum subscribed for this fund was finally approved of at a meeting of the general committee which took place at the Guildhall, Newcastle, on December 16th, under the presidency of the mayor, Mr. Thomas Hedley. As we mentioned in a former number, the committee had decided upon distributing the surplus among the twelve districts of inspection in England and Scotland. The following table shows the proportion to which each district is entitled, founded on a basis averaged upon the quantity of coal raised annually in each district for the seven years 1856—1862, and the actual loss of life in connection with coal mining in each district for the same period. The committee were in hopes of making a distribution on the number of coal-miners employed in each district, but were obliged to abandon it from the impossibility of getting satisfactory returns; and in default of this they consider the basis upon which this table is founded to be as equitable as any other that could be obtained. The recipients of relief number at present 419—widows 93, adults 33, and children 293.

Districts.	Basis No. 1. Coal raised Annually in each District on an average of 7 Years. 1856-1862.	Basis No. 2. Lives Lost Annually in each District on an average of 7 Years. 1856-1862.	Division on Basis No. 1.			Division on Basis No. 2.			Division on an average of Bases Nos. 1 and 2.		
	Milln. Tons.	Lives Lost.	£	s.	d.	£	s.	d.	£	s.	d.
1. Derby, Nottingham, Leicester, and Warwick	5.5	49	1,429	5	7	973	1	1	1,201	3	4
2. North and East Lancashire	5.8	84	1,507	4	9	1,668	1	0	1,587	12	11
3. North Durham, Northumberland, and Cumberland	8.4	126	2,183	0	0	2,502	2	0	2,342	11	0
4. North Stafford, Shropshire, and Cheshire	3.7	63	961	10	8	1,251	1	5	1,106	6	0
5. South Durham	11.9	78	3,092	9	3	1,548	18	0	2,320	13	8
6. South Stafford and Worcestershire	5.5	140	1,429	5	8	2,788	3	3	2,104	14	5
7. South Wales	5.9	132	1,533	5	10	2,621	4	11	2,077	5	5
8. South Western	5.	83	1,299	6	8	1,648	3	9	1,473	15	2
9. West Lancashire and North Wales	7.1	19	1,845	1	6	1,807	2	1	1,826	1	10
10. Yorkshire	8.7	91	2,260	18	3	1,807	2	1	2,034	0	2
11. Eastern District: Scotland	4.9	43	1,273	5	0	853	18	1	1,063	11	7
12. Western District: "	6.	46	1,539	14	0	913	9	7	1,236	11	9
	78.4	1,026	20,374	7	3	20,374	7	3	20,374	7	3

THE NEW ALUMINIUM ORE.

In the last number of the *Revue Universelle*, M. A. Stévant has a note on the new aluminium ore used at the Salyndre works, which has been named *Bauxite* by M. H. Ste. Claire-Deville, but which M. Stévant has regarded as a ferruginous diasporé, its average composition being:—

Alumina	60
Ferric oxide	25
Silica	3
Water.. .. .	12

100

But although this may be taken as an average, its composition is really very variable: thus it sometimes contains no silica, and at others the alumina and ferric oxide are in such proportions that every stage is observable from the pure ore of aluminium to an aluminous iron ore, yielding as much as 45 % of metallic iron in the crucible. At times it also contains from 1 to 2 % of titanium, and, what is more curious, vanadium in a very notable proportion.

The bands or lodes that yield this ore are very numerous in the departments of the Var and the Bouches-du-Rhone, forming a zone bearing W.W.N. and E.E.S., from the neighbourhood of Tarascon to near Antibes, an extent of more than 150 kilometres (95 miles). Some bands can be traced for a length of more than 1 kilometre (three-fourths of a mile), with a thickness of several scores of feet. They seem, in fact, to be dykes penetrating the cretaceous formation. M. Delesse points out that analogous rocks are found in Southern Italy and at Senegal.

In conclusion M. Stévant takes occasion to object to M. Deville's name of *Bauxite*, for this undefined mixture of two definite rocks. M. Stévant considers that if a practice of this kind were followed out, a multitude of new names would have to be invented for the mixture of blende and galena, pyrites and blende, &c., found filling the veins on the banks of the Meuse. He prefers his name of ferruginous diasporé, as giving a true idea of the composition of the ore, while the word *Bauxite* has no interest except for the inhabitants of the commune of Baux, where this ore was first discovered.

THE BOARD OF TRADE RETURNS.

The "Accounts relating to Trade and Navigation of the United Kingdom, for the month ended 31st October, 1863, and ten months ended 31st October, 1863," have been issued by the Statistical Department, Board of Trade.

IMPORTS.—The quantities and relative increase and decrease of the imports of metals, metallic ores, and mineral products, for the month and ten months ended 31st October, have been as follows:—

	Month ended 31st October.			Ten Months ended 31st October.		
	1862.	1863.	Increase (+) or Decrease (—).	1862.	1863.	Increase (+) or Decrease (—).
Brimstone cwt.	56,938	102,020	+ 46,082	901,373	689,313	— 212,060
Copper Ore tons	2,674	7,161	+ 4,487	66,559	65,850	— 709
Copper Regulus "	3,019	1,978	— 1,041	23,821	16,562	— 12,259
Copper, unwrought and part wrought cwt.	10,100	20,000	+ 9,900	216,480	198,580	— 17,900
Iron, in Bars, unwrought tons	5,423	7,451	+ 2,028	33,182	36,216	+ 3,034
Steel, unwrought "	350	277	— 73	8,536	2,029	— 1,507
Lead, Pig and Sheet "	2,397	2,114	— 283	17,705	20,791	+ 3,086
Spelter or Zinc "	2,180	3,049	+ 869	14,696	24,182	+ 9,486
Tin, in Blocks, Ingots, } Bars, or Slabs cwt.	4,186	2,965	— 1,221	62,459	37,656	— 24,803
Silver Ore... .. value in £	51,050	7,910	— 43,140	269,838	198,291	— 71,547
Petroleum tons	706	553	— 153	13,780	30,429	+ 16,649
Quicksilver lbs.	401,311	—	—	833,449	1,162,733	+ 319,284

EXPORTS.—The quantities, declared value, and relative increase and decrease of the exports of metals, minerals, and metallurgical articles of British and Irish produce and manufactures, for the month and ten months ended 31st October, have been as follows:—

	QUANTITIES.				DECLARED VALUE.							
	Month ended 31st October.		Ten Months ended 31st October.		Month ended 31st October.		Ten Months ended 31st October.		Increase (+) or Decrease (-)			
	1892.	1893.	1892.	1893.	1892.	1893.	1892.	1893.	1892.	1893.		
Alkali: Soda	154,763	212,528	1,765,698	1,890,721	65,320	83,401	+	16,881	\$ 747,769	\$ 748,794	+	1,025
Coal, Cluders, and Culm	680,698	844,685	7,134,621	7,084,014	305,636	379,401	+	73,865	8,147,276	8,147,276	+	60,645
Pig and Puddled	32,165	47,821	385,316	413,722	90,145	136,245	+	46,100	1,008,501	1,131,242	+	95,741
Iron, Bar, Angle, Bolt, and Rod	24,061	30,195	135,381	97,581	182,769	353,583	+	170,814	2,092,150	2,092,151	+	235,101
Iron, Railroad, of all sorts	33,357	33,886	343,204	397,193	246,235	264,462	+	18,227	2,379,843	2,379,843	+	445,089
Iron, Cast	3,872	7,250	65,068	71,463	36,109	73,329	+	37,220	465,847	465,847	+	139,783
Iron Hoops, Sheets, and Boiler Plates	9,185	15,220	86,047	116,649	85,113	189,387	+	104,274	844,564	1,369,113	+	524,549
Iron, wrought, of all sorts	11,743	11,793	89,639	92,848	248,205	246,330	-	1,886	1,767,210	1,804,083	+	36,872
Iron, old, for re-manufacture	3,474	1,090	21,514	12,878	12,752	4,383	-	8,371	63,852	48,440	-	15,412
Iron Steel, unwrought	1,147	2,719	21,252	23,122	38,430	90,175	+	51,765	688,924	747,567	+	58,663
Copper, unwrought, in Ingots, Cakes, or Shales	7,924	21,782	88,254	231,483	38,973	100,885	+	61,912	430,861	1,068,180	+	637,319
Copper, wrought, or partly wrought, Bars, Rods, Bolts, Pins, Plates, Sheets, and Nails; and mixed or Yellow Metal for Sheathing	36,660	56,367	350,761	471,199	171,544	262,941	+	91,397	1,697,616	2,155,422	+	517,806
Copper, wrought, of other sorts	2,066	435	28,304	8,649	13,290	2,970	-	10,320	140,498	53,126	-	87,372
Brass of all sorts	2,389	6,254	31,244	37,499	14,258	26,756	+	12,497	169,957	188,763	+	18,775
Lead, Pig, Rolled, Sheet, Piping, Tubing, and Lead Shot	3,749	9,058	29,815	30,373	78,614	44,697	-	33,917	630,914	683,519	+	92,605
Zinc Ore, Lead, Red and White, and Litharge of Lead	355	504	6,744	5,524	8,553	19,487	+	8,935	152,794	133,283	-	19,512
Salt	53,875	49,248	568,610	555,223	26,157	22,072	-	4,085	274,144	226,399	-	17,545
Tin, unwrought	5,788	11,347	71,657	72,157	38,569	58,583	+	20,014	414,525	430,277	+	5,452
In Plates	65,312	101,453	881,892	982,514	80,491	120,374	+	39,883	1,062,455	1,094,271	+	31,816
Sulphuric Acid, or Spelter, wrought or unwrought	8,099	9,900	77,837	85,525	8,284	10,889	+	2,604	78,804	88,573	+	9,769
					1,784,296	2,382,039	+	597,743	18,027,478	20,637,167	+	2,609,679

JUKES'S SCHOOL MANUAL OF GEOLOGY.

The School Manual of Geology. By J. Beete Jukes, M.A., F.R.S., Local Director of the Geological Survey of Ireland. Edinburgh, Adam and Charles Black.

This volume is to a great extent founded on Mr. Jukes' well-known *Students' Manual of Geology*, originally published about five years ago, but a second, and greatly enlarged, edition of which appeared in 1869. We have often had occasion to refer to this work, which we hold to be beyond comparison the best Manual of Geology in the English language; and it is therefore with much pleasure that we now see its substance appearing in the present more elementary and cheaper form.

But although founded on his larger work, the present volume is by no means a mere summary of the former, nor indeed is the arrangement entirely the same. There is a considerable quantity of new matter, and every point seems to be worked up to our most recent knowledge—for instance we have given us the valuable information published this year by Captain E. B. Hunt, U.S.A., on the Florida reef; of a reference to the true age of the Bovey Tracey lignite deposit, determined by Mr. Pengelly and M. Heer; and a pretty full discussion of the Antiquity of Man controversy.

From Mr. Jukes' experience as a working Geologist—labouring for a long period among the coal-fields of the Midland Counties, and more recently on the wider field of directing the operations of the Irish Survey—we expected a practical work, and that expectation has been amply fulfilled. This school manual is thoroughly practical, and as such we can safely recommend it to our mining friends. We can imagine no better text book for elementary classes; or for the working man desirous of mastering the more simple facts and elementary principles of the science of geology.

THE RATING OF COAL MINES.

We referred on a former occasion (see *Mining and Smelting Magazine*, vol. iii, p. 41) to Mr. T. F. Hedley's remarks on this subject, and now add the substance of a letter from him to a large coal-owner in the northern district. After referring to the two propositions recently made—one by the magistrates of the county of Northumberland, and the other by Mr. Hugh Taylor, as to the rating of collieries on the actual rent of each, charged at the existing rate of rental payable to the lessor,—Mr. Hedley says that on such a principle it is evident that only a part of the value of a current going colliery would be rated, viz., the rent actually paid for the coal, from which rent it is further proposed to deduct 25% for repairs of buildings and plant, which “buildings and plant are necessary to render the mine productive.” But the value of these buildings and plant, as well as the value of the land occupied with the collieries and buildings, is wholly excluded from these calculations, which seem to lead to the conclusion that “the large outlay of capital in sinking the shaft, in erecting buildings, engines, and plant necessary to make the mine productive,” gives no enhanced value to the coal; in other words, that the lessee of the coal would pay no additional rent if the lessor, in addition to demising the coal at a fair rent, also supplied the capital to sink the shaft, erect the buildings, engines, and fixed plant. This, surely, cannot be correct; for there is no doubt but that the lessee would gladly pay an additional rent if the lessors would supply the capital necessary to sink their shaft, &c. Mr. Hedley cannot, therefore, think that the royalty rent actually paid

under agreements made between the lessees and lessors perhaps 15 or 20 years ago can be the reasonable rent contemplated by the Parochial Assessment Act. Even supposing the royalty rent be taken as the standard of value, even then there should be added to this the improved value of the coal by the outlay of capital in sinking shafts, erecting buildings, engines, &c., so as to arrive at the rateable value, or that rent which a tenant would give for a current going colliery, as clearly laid down in *R. v. Granville*, where the Court of Queen's Bench held "that the defendant having improved the value of the mine by erecting engines and making railroads, he was properly rated upon the improved value, in addition to the rent."

He next turns to a consideration of the deductions allowable. The first class of deductions will be for repairs and insurance, or other expenses, if any, necessary to maintain the property. No repairs can be required for the coal; it is difficult to see how it can be insured, but still $1\frac{1}{2}\%$ on the annual value may be allowed on this head; and being essentially exhaustible, it cannot possibly be maintained, although a sufficient deduction should be made to provide for the redemption of the capital value of the coal when exhausted—which, taking its duration at 50 years, he calculates, would be met by a sinking fund of 16s. 6d. per cent. per annum. The second class of deductions will be for repairs of the building repairable by the lessor, which he takes at 1% per annum; to which should also be added such an allowance as to provide for the maintenance of the lessor's rent for the buildings and plant, which will necessarily cease when the coal is worked out.

Illustrating these views by the case of a colliery paying a rent or royalty of 8,000*l.* a-year; on which the lessor has expended 125,000*l.* in sinking shafts, erecting engines, offices, cottages, and making railways; all of which occupy 120 acres of land worth 5*l.* per annum per acre, we have:—

1st. Royalty rent	£8,000
2nd. Rent of shaft, buildings, and plant, calculated at 5% on 125,000 <i>l.</i>	6,250
3rd. Rent of land	600
Total gross rent	£14,850
<i>Deductions:—</i>	
Insurance of royalty	£960
Redemption of royalty	792
Lessor's repairs to buildings	750
Redemption of buildings	900
	<u>3,402</u>
Showing a rateable value of	<u>£11,448</u>

In conclusion Mr. Hedley argues at great length on the justice of these views; and ends by suggesting that all parties should agree to state a case for the opinion of the Court of Queen's Bench, so as to obtain a judicial decision as to the principle on which the rating of collieries should be based.

Extracts, Notes, and Memoranda.

SUGGESTION FOR COLLECTING BLAST-FURNACE GASES.—A recent correspondent (B. T.) to the *Mining Journal* objects to the plans at present in use for collecting the waste gases of blast-furnaces, and suggests a device which he considers will be found effective in remedying the defects of such plans. To carry out this effectually the furnace should be built expressly, but it may be accomplished approximately by alterations in any existing furnace. In a furnace built on purpose the hearth and boshes may be of any approved form, size, or pitch. The body must be cylindrical (in all cases probably the best), with a dome-formed top, upon which is to stand the throat, 8' diameter and 10' high: the width of the body is immaterial. About two-thirds up around the dome, the gas flues should be inserted, twenty-five to thirty in number, made steep to prevent the lodgement of dust: which flues lead into a large annular one surrounding the throat, 2' wide and 3' high, from the top of which four man-holes at least, extending upward, and safely covered at top, are constructed, for the purpose of occasionally cleansing the flue from any accumulated dust. From two opposite points of this flue the gas will be taken for use. The throat, when filled half-way up, will securely prevent the issue of gas upward, or the influx of atmospheric air downward. The exterior width of the furnace at top should be sufficiently great to admit of a parapet wall being run around it, not less than 6' in height (a doorway, of course, to admit the charges), which will be found a useful protection to the chargers in bad weather.

CALIFORNIAN "STATE FAIR."—The "fair," or exhibition, of the State of California was held at Sacramento about the beginning of October. There was a good display of the mineral produce of the State, and also a few interesting examples of mining machinery. Several thousand specimens of minerals from various districts were exhibited. The Virginia City district sent only few specimens; the Esmeralda exhibited gold, silver, copper, and tin; and Humboldt district, among other things, specimens of bromide and chloride of silver. Reese River district sent a number of specimens of chloride of silver, which had been subjected to the action of heat, condensing the silver in small globules and flakes on the surface of the rock. The exhibition also included every variety of gold, silver, and copper. Among the machinery Varney's Amalgamator attracted a good deal of attention, as also Mr. Hughes' Eyeless Screw Pick, and his Blasting Apparatus.

ANOTHER BORING MACHINE.—A patent has been granted to Mr. George Low, of Newark-upon-Trent, for improved machinery for boring rocks and other hard substances. The machinery proposed consists essentially of a frame in which is mounted a series of cylinders, fitted each with a piston attached to a hollow rod, which carries at one end a hollow boring tool. The frame runs on wheels, for driving horizontal levels or railway tunnels, or working on the face of quarries; but it may be arranged so as to hang from a chain when employed for sinking perpendicular or inclined shafts. Another form of frame is a portable one, consisting of a pillar or column which can be adjusted by the attendant in any position between the top and bottom of a level or heading. In one arrangement the working cylinders are set on guide frames along which they slide by a self-acting worm and screw motion, according to the progress of the boring tool. Each of the cylinder frames is so arranged as to admit of being easily moved by the attendant either vertically or sideways, and also at any angle in either direction, for the purpose of bringing each of the tools into a position suitable for most

effectually attacking the rock to be bored. The pistons are worked either by steam conveyed by pipes covered with felt or by compressed air, or by any other motive gases.

SUGGESTED IMPROVEMENTS IN TREATING TARANAKI ORE FOR IRON AND STEEL.—Provisional protection has been granted to Mr. John Kirkham for improvements in the manufacture of iron and steel, the objects of which are to facilitate the conversion of the granular iron ore, obtainable in such large quantities from the district of Taranaki, New Zealand, into iron and steel. The difficulty hitherto experienced in the smelting of this granulated ore or sand has been that the blast of a smelting furnace has been found to disperse it, so that it has been found necessary to smelt it in saggars or pots, the cost of which has prevented the economic use of the ore. In order to obviate these disadvantages, and to effect the smelting of this fine ore of iron, Mr. Kirkham proposes to melt in the first instance a quantity of pig-iron in a cupola furnace or otherwise to obtain fluid iron. This fluid metal is then run into what is termed a mixing furnace, to which is added a suitable quantity of the Taranaki ore, the whole being stirred so as to ensure a thorough mixing; when the hot metal, acting as a solvent, takes up into combination the granulated ore. About one-half of this mixture is then discharged into a puddling furnace, and treated according to the product required. The remainder of the iron is returned to the cupola furnace to be re-heated to render it fit to receive a second dose of the Taranaki ore. It is also proposed, instead of using fused metal, to incorporate the Taranaki ore with some plastic material, such as chalk, clay, or other like substance, that, when moulded, will hold the particles of ore together while being subjected to the blast of the smelting furnace.

THE METALLIC MINES COMMISSION.—Lord Kinnaird, Sir P. Egerton, N. Kendal, Esq., M.P., R. Davey, Esq., M.P., and P. Holland, Esq., the commissioners recently appointed to inquire into the condition of mines other than those comprised in the Mines Inspection Act, visited Newcastle on December 14th, to inspect one or two of the principal collieries, and examine some of the leading scientific men connected with the northern coal-field. The object of the visit seemed to be to collect information as to the practicability of introducing guide rods, cages, &c., into the Cornish and other metallic mines, where the shafts are not always vertical, and also as to the best means of ventilating such mines. On Monday the commissioners visited the well-known collieries at Seaton Delaval, under the guidance of Mr. T. E. Forster, and his son, Mr. G. B. Forster. On Tuesday morning they commenced to take evidence. Messrs. Nicholas Wood, T. E. Forster, G. B. Forster, Matthias Dunn (Inspector of Mines for Northumberland, Cumberland, and North Durham), J. J. Atkinson (Inspector for South Durham), T. Hurst (Backworth), Alex. Blyth (secretary to the Miners' Relief Fund), and J. Johnson (Dudley Colliery) were in attendance. The examination was conducted in private, but we understand that the inquiry was limited to the objects enumerated above.

CONVERTING CUPOLAS AND CRUCIBLES WITH A HOLLOW CASING.—A patent has been granted to Dr. A. P. Price, of Lincoln's-inn-fields, for improvements in apparatus employed in the fusion, manufacture, production, and refining of metals. These improvements consist in so constructing cupolas, crucibles, or other similar vessels employed for the fusion and production of cast-iron, steel, or other metals, or for the conversion or refining of cast-iron in the manufacture and production of iron or steel by the injection of air, or that process known as the atmospheric process, in such a manner that they shall be surrounded entirely or partially with a hollow casing of cast or malleable iron, or other suitable metal, so that a current of water, or jet of steam, or a blast of air may circulate freely around such hollow casing, by which means the sides of the vessel may be cooled, and the lining preserved from the destructive action of the heat

and fluxes. When this casing is applied to crucibles or converting vessels used in the conversion of cast-iron into steel or iron that require to be moveable, the casing should be so constructed that it shall be closed except for the admission of suitable inlet and outlet pipes, so that no water, steam, or air shall escape except by such outlets, when the vessel is moved for the purpose of discharging its contents. The inner surface of the casing may be lined with fire-brick, clay, or any other suitable material.

ALKALI WORKS.—On the 1st of January the Act passed in the last session of Parliament for the more effectual condensation of muriatic acid gas in alkali works will come into operation. The term "alkali" is to mean every work for the manufacture of alkali, sulphate of soda, or sulphate of potash in which muriatic acid gas is evolved. The object of the statute is to secure the condensation of this gas to the satisfaction of the inspector or sub-inspector appointed under the Act. If it should appear to the Court before whom any proceeding for the recovery of a penalty is instituted that 95 % at least of the muriatic acid gas evolved has not been condensed, a penalty not exceeding 50*l.* will be levied, and for a second offence 100*l.* The owner is to be liable in the first instance, unless he prove that the offence was committed by some agent without his knowledge, in which case the agent is to be liable. The Board of Trade is to appoint inspectors, and alkali works are to be registered.

VENTILATING MINES BY HOT AIR AND STEAM.—Provisional protection has been granted to Messrs. I. M. Evans, of Cefn Mawr, Denbighshire, and W. T. Griffiths, of Merthyr Tydvil, Glamorganshire, for improved means for ventilating mines. Their object is to ventilate mines by means of steam and heated air without the use of open furnaces. The arrangements adopted for this purpose are as follows: a tower or similar structure, open at the top (except as hereafter stated), is erected close to the upper part of the up-cast shaft; and from the lower part of this tower are led hot air tubes in communication with a fire-clay pipe or channel formed at one or each side of the furnace of a steam boiler—the air in this pipe being thus heated and supplying the interior of the tower at the lower part. It is preferred to carry a steam pipe from the top of the steam boiler into an upper point of the interior of the tower, at the end of which pipe a steam box is provided, having a ring of jet pipes projecting upwards from it; and above this box it is also preferred to have attached at or near the top of the tower an inverted cone or dome, so that a quick and adjusted draft may be attained. The tower containing this inverted cone may be widened out so as to have a greater interior area in the upper part, and the inverted cone may be raised or lowered for adjusting the draft. The bottom of the tower is made inclining towards the centre, so as to carry off any condensed water that may fall. For mines having only one shaft the foregoing arrangements may be connected with the up-cast side of the brattice. By these arrangements it is supposed the hot air and steam in the tower will cause a powerful draft in the up-cast and in the connected workings.

SHEET-IRON MOULDS FOR CASTING STEEL OR IRON.—A patent has been granted to Mr. Robert Mushet, of Coleford, for improvements in moulds to be used for casting steel or homogeneous iron. The suggestion consists essentially in making the moulds in which articles of such a composition are cast, as, for instance, wheel tyres or cylinders, either wholly or mainly of sheet iron. When a cylinder of steel or homogeneous iron is to be cast, a sheet-iron hollow cylinder is made, of the same external diameter as the internal diameter of the cylinder to be cast, but three or four inches higher. This hollow cylinder forms the inner part of the mould; a second hollow cylinder of sheet iron, the internal diameter of which is equal to the external diameter (but three or four inches higher), constituting the outer

part of the mould, between which and the first sheet is prepared a bed of sand or loam, upon which is set up perpendicularly the sheet-iron hollow cylinders, the smaller one equidistant at all parts of its circumference from the inner circumference of the larger one. The inner sheet-iron hollow cylinder is filled with loose sand or with a loam core, this core having the general figure of a cylinder, but divided by planes intersecting one another in the axis of the core. The several portions of the core have in cross section the figures of sectors of a circle, and are loosely fitted together so as to allow for the shrinkage of the steel or homogeneous iron cylinder after it has been cast. Around the exterior sheet-iron hollow cylinder, and between it and the foundry-box in which it is placed, a quantity of sand is rammed as firmly as possible to back up and support the larger sheet-iron hollow cylinder when the melted steel or homogeneous iron is poured into the mould. When the two parts of the mould are thus arranged, the annular space between the inner and outer parts of the mould are covered with a layer of loam or with a cast-iron plate, leaving one or two openings through which the melted steel or homogeneous iron is poured; air holes being also left for the escape of any gas or steam generated. In preparing the mould care is taken to remove from the interior surface of the larger sheet-iron hollow cylinder, and from the exterior surface of the smaller one, all the scale or oxide of iron, either by scouring the surfaces, or by cleaning them with acids; the object of which is to prevent the steel or iron from coming in contact with oxide of iron, which would cause the generation of gas and occasion cells or honeycombs to be formed in the body of the cylinders to be cast. The thickness of the sheet-iron employed for the manufacture of the moulds has been found in practice to answer best from one-sixteenth to three-eighths of an inch, but it may be varied to suit the size or weight of the castings to be made.

SLATE QUARRIES IN THE UNITED STATES AND CANADA.—Mr. R. Bell, of the Geological Survey of Canada, in a paper on this subject read before the Canadian Natural History Society, states that the annual value of the slates produced in Wales alone is nearly 1,000,000*l.* sterling, and the nett profits of many of the companies engaged in this branch of industry are upwards of 50%. The most important slate-producing district in North America is situated in the State of Vermont. But little of the deposit in Eastern Vermont can be profitably worked owing to contortions, imperfect cleavage, cross-joints, and the presence of foreign ingredients. Bands suitable for the manufacture of roofing slate were only found occasionally in this district. The quarries in the western part of Vermont appear to be more productive than those in the eastern part of the State. It seems that this slate is used for other purposes than roofing. Mantelpieces, table and bureau tops, billiard-table beds, and lamp bottoms are manufactured from it. The slates produced from the Northfield quarries, Vermont, sell at \$3½ a "square," delivered in the cars. In Canada the price is 50 cents less per square, delivered at Richmond. A square of slates is 100 square feet; and the greater the number of slates making up this area, the less the price. The most important slate quarries in Canada occur in the eastern townships. Geologically speaking, they belong to rocks of the Quebec group. The author described other probably favourable localities for roofing slates in Eastern and Western Canada.

CRUSHING, GRINDING, AND DRESSING METALLIC ORES.—A patent has been granted to Mr. Joseph Mosheimer, of Dolgelly, for certain improvements in machinery for crushing, grinding, and dressing metallic ores, quartz, and other similar substances. The patentee describes these alleged improvements under three heads:—*First*, he describes his stamps as a metallic crushing weight, hammer, or stamp, attached to a vertical shaft, upon which adjustable and incline tappets are secured, and which are acted upon by lifting cams in such a manner as to lift the hammer and allow it

to fall by its weight ; the angle of the tappet effecting the partial revolution of the hammer or stamp at each stroke, so as constantly to present a different surface to the ore, which is supplied beneath the hammer upon a die or foundation ; the whole being inclosed in a casing or mortar, and the crushed ore issuing therefrom by means of a screened aperture. When wet ore is being crushed a space is left in this mortar lined with copper for amalgamating with mercury any gold or precious metal that may come in contact therewith. The *second* part of the invention relates to an arrangement for "sizing" the ore, which does not appear to present much novelty. A *third* portion of the invention describes the further dressing of the ore, by what appears to be a form of shaking table. The arrangement is described by the patentee to consist in a number of "hoppers" or delivery boards, one or more supplying a table with the pulverised ore and others supplying water thereto ; the table being suspended at an angle and caused to reciprocate laterally by means of an eccentric and rod, so that the ore is spread evenly over the surface at the upper edge of the table, but by the reciprocating motion the valuable portion of the ore accumulates at one side of the table, the middle quality near the centre, and the inferior portion at the other side. Another arrangement for the same purpose consists of a revolving table divided by radiating ridges and sloping to the centre, and furnished with a series of inclined planes, or "hopper boards," gradually converging to the centre of the table, each alternate hopper being for the ore and the other for water, the centre surface of the table also being supplied with a continuous stream of water by means of a perforated pipe round the periphery of the table.

DRYING COAL BY CENTRIFUGAL FORCE.—A patent has been granted to Mr. Prosper Hanrez, engineer, Belgium, for improved machinery for drying coal. It consists of a central shaft, mounted in a socket in such a manner as to allow of a sufficiently rapid motion being imparted to it to throw off by the effect of centrifugal force the water contained in the coal. On this shaft is fixed a circular ring or crown, to which is attached a frame covered with wire-cloth or perforated sheet metal, the holes being of such a diameter that the water will escape while the coal will be retained. A hollow shaft, concentric with the first, turns rapidly in the same direction, but with a different velocity, serving as the axis to a spiral screw of which the exterior diameter is equal to that of the interior of the perforated cylinder. By the action of this screw the coal, which is being continually fed to the apparatus by a hopper, will fall on to the top thread of the screw, which is slightly curved upwards or flanged in order to collect or throw over the matters more quickly. By the rapid rotation of the screw the coal is thrown against the sides of the drum down which it falls, deprived of its moisture, into the reservoir arranged to receive it. The rotation of the drum and of the screw can be so adjusted as to insure the coal being retained in the apparatus until it is perfectly dry.

DRESSING ORES BY A CURRENT OF AIR.—A patent has been granted to Mr. William Clark, on a communication from M. L. P. Langlois, of Paris, for improvements in separating ores from their gangues. The novelty of the system proposed consists in applying a current of air instead of water for this purpose. The apparatus is formed of a hopper, which conveys the pulverised ores into a current of air produced by one or more blowing machines ; which current of air, while it throws the lighter and poorer particles a considerable distance, only throws the richest and heaviest ores, that is, those containing the greatest quantity of metal, the least distance, thus effecting the classification of the whole, according to their density and their collection, in suitable receptacles. If a single blower is insufficient, two or more are employed, placed one above another, whereby the metallic particles, after being partially classified by the action of one blower, pass under the action of a second blower, which completes the classification.

MIXTURE OF SPIEGELEISEN AND SIMILAR ALLOYS WITH MELTED STEEL AND IRON.—Mr. Robert Mushet, of Coleford, has recently patented some further improvements, by which he proposes thoroughly mixing, without the agency and deteriorating effects of the pneumatic blast, melted spiegeleisen or other metallic alloys, such as alloys of tungstein and iron, or of titanium and iron, with melted steel or malleable iron, prepared by the pneumatic process from melted pig-iron or cast-iron. This he proposes to effect either by the use of two pneumatic or decarbonising vessels, both containing melted steel or malleable iron made by the pneumatic process, into one or both of which the melted spiegeleisen or other metal alloy has been introduced, when the contents of one vessel is poured into the other so as to mix them intimately, and make the whole of uniform composition; or by the use of one, two, or more such vessels in which the metal to be operated on may be produced, and another or supplementary vessel (which previous to use has been intensely heated) in which the melted spiegeleisen and iron or steel may be mixed.

WELSH *versus* NORTHCOUNTRY STEAM COAL.—A meeting of the principal steam colliery proprietors of South Wales was held at Cardiff on November 25th, Mr. Thomas Powell in the chair. The objects of the meeting was to receive the report of Mr. Tomlinson, C.E., Locomotive Superintendent of the Taff Vale Railway Company, who had been deputed by them to watch the recent Government experiments at the Keyham steam-yard, Devonport, which we referred to last month. From his report it would appear that these experiments clearly showed the superiority of the Welsh over the North of England coal for steam purposes—a superiority equal to 18%, according to Mr. Tomlinson. The meeting was so gratified by this report that they unanimously resolved it should be printed in both the English and French languages, and circulated as widely as possible.—In reference to this report Mr. Thomas Doubleday, secretary of the coal trade of Northumberland and Durham, wrote to the *Times* on December 15th that the statement that the “general result” of the Keyham experiments showed a difference of 18%, or any difference at all, in favour of Welsh steam-coal, was an assertion the reverse of the truth. He further commented on the impropriety of circulating *ex parte* statements before the publication of the Government official report; and requested the public—more especially those interested in the matter—to suspend their judgment until such report should appear. — In reply to this Mr. Powell re-iterates the statement as to the great superiority shown by the Aberdare over the Hartley coals at Keyham—1 lb. of the former having evaporated 10·01 lbs. of water, against 8·67 lbs. evaporated by the Hartley coal. He further alleges that in practice on board steamers the difference is even far greater in favour of Welsh coal.

At the meeting of the Geological Society on December 2nd, a continuation (being part IV) of Professor Haughton's well-known “Experimental Researches on the Granites of Ireland” was read. The special subject was the Granites and Syenites of Donegal, compared with those of Scotland and Sweden. The importance of these inquiries and the labour involved in them are we fear scarcely at present appreciated in this country as they should be. We shall refer to this paper *in extenso* on a future occasion.

The chair of chemistry at Berlin, vacant by the death of M. Mitscherlich, has been offered to Dr. Hofmann, of the Royal School of Mines. The University of Bonn has already made him a similar offer, and has placed at his disposal a sum of 20,000*l.* for the establishment of a laboratory. We understand that Dr. Hofmann has not yet decided to accept or decline

either of these offers and abandon his position in this country, but he is about paying a visit to Germany.

The San Francisco *Mining and Scientific Press* states that Mr. Churchill has in his possession several specimens of ore in which cadmium is associated with antimony. The ore is from the Cherokee lead, in the Humboldt district. In one of the specimens the ore is crystallised in fibres and much resembles the Franklin and Sheba ores from that district.

Monsieur L. Moissenet, the eminent French Mining Engineer, so well known in this country as the author of several valuable papers on the mining processes of Cornwall, is now engaged on the preparation of a paper of Lead Dressing in this country—principally illustrated by a description of those processes in use in the Cardiganshire lead mines under the management of Messrs. John Taylor and Sons.

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 3070 (1860). R. MUSHET, Manufacture of iron and steel.
 2939 (1860). E. C. PERRY, Preventing accidents in or at mine shafts.
 2949 (1860). W. S. LOSH, Preparing sulphurous acid in solution.
 3038 (1860). J. TOWNSEND and J. WALKER, Treatment of bye products of soda and potash for the obtainment of antichlores.

PATENT ON WHICH £100 DUTY HAS BEEN PAID, NOV. 20TH.

- 2767 (1856). T. ROBERTS, J. DALE, and J. D. PRITCHARD, Improvements in obtaining and purifying oxalate of soda, applicable also to the manufacture of oxalic acid.

PATENTS VOID BY NON-PAYMENT OF DUTY, FROM NOV. 14TH TO DEC. 12TH.

- 2804 (1860). W. H. RALSTON, Manufacture of soda ash.
 2788 (1856). C. E. HEINKE, Apparatus for giving light in mines.
 2957 (1856). H. PEASE and T. RICHARDSON, Manufacture of compounds of alumina.
 3080 (1860). H. BARBER, Improvements in lamps used in mines.
 3087 (1860). J. G. WILLIAMS, Improvements in extracting noxious gases from mines.

BELGIUM.

PATENTS DELIVERED FROM NOV. 30TH TO DEC. 15TH.

- 15,186. BOIGUES, RAMBOURG, and Co., Apparatus for washing coal.
 15,217. N. LIBOTTE, Parachute for mines.
 15,224. P. A. DE SAINT-SIMON SICARD, Crucible furnace for smelting metals and refractory substances.
 15,234. C. ALLARD, Parachute for mines.
 15,258. A. PALLU, Manufacture of white of zinc.
 15,283. P. J. DUBAB, Sinking shafts of mines in shifting soil.
 15,291. A. A. GAUDIN, Treatment of iron, steel, and cast-iron.
 15,299. A. PALLU, Improvements in the manufacture of white of zinc.
 15,305. A. B. BERARD, Preparing mineral substances.
 15,309. T. AGUDIO, Traction on inclined planes of mines.

- 15,221. G. E. DONISTHORPE, Machines for extracting coal and other ores.
- 15,353. N. J. LEBRUN, Parachute for mines.
- 15,361. A. DINANT, Fastening miners' lamps.
- 15,365. H. BENNETT, Puddling iron and steel.
- 15,383. E. PLUNUS, An alloy of various metals, applicable to special purposes.
- 15,385. M. COLSON, Transmitting motion to apparatus used for extracting minerals from mines.

FRANCE.

CURRENT LIST OF PATENTS.

- 58,425. QUENNESSEN, Moulding and applying platina.
- 58,493. ARNOULD, Modifications in miners' lamps.
- 51,520. SONSTADT, Manufacture of magnesium metal.
- 58,546. SAUNDERS and PIPER, Manufacture of dull and shining tin plate.
- 58,553. VIREY, Improvements in smelting iron ores.
- 58,621. CANENAILE, Improvements in safety lamps for miners and others.
- 58,624. COLSON, Machines for extracting coal.
- 58,649. BOURQUIN, Apparatus for boring rocks for blasting.
- 58,687. NICLOSSE, Apparatus for purifying petroleum.
- 58,688. NICLOSSE, Furnaces for distilling petroleum.
- 58,736. CARRIE, Instrument for discovering beds of metals.
- 58,748. LIPINSKY, Manufacture of white of zinc.
- 58,761. VIEILLE-MONTAGNE COMPANY, Mixed furnace for the reduction of zinc ores.
- 58,886. PEUGEOT, BROTHERS, Rolling steel at a continuous heat.
- 58,927. DORDIGNY and Co., Substituting sulphate of iron obtained from pyrites for chips of iron in the manufacture of iron.
- 58,979. ALLIN, A process of tempering cast-iron.
- 59,003. MALLET, A process for preparing oxide of hydrated iron.
- 59,110. CHEVALIER, Manufacture of prussiate of potash from the arsenical residue obtained from aniline red.
- 59,144. BRISSON, Obtaining wrought-iron by single fusion.
- 59,154. GERMAN-CLEGG, Furnace for distilling schist and other bituminous substances.
- 59,203. CHAILLON, Excavating apparatus for mines.
- 59,205. COLSON, Apparatus for lowering and raising workmen in mines.
- 59,231. BARTHE, Process for simultaneously obtaining pig and refined iron by means of the same fuel.
- 59,249. MARTIN, Treatment of mineral oils and hydro-carburets.
- 59,277. JEAN, Preparing coal dust.
- 59,282. PETIN, GAUDET, and Co., Manufacture of sheet iron.
- 59,304. GARDNER, Treatment of petroleum and mineral oil.
- 59,308. HENDERSON, Processes for extracting iron and steel from certain ores and residues.
- 59,371. BEDSON, Construction of cupola, blast, and puddling furnaces.
- 59,443. JACQUET, sen., Apparatus for boring holes for mines in all soils.
- 59,458. CARVES and Co., Utilising old coke kilns for simultaneously obtaining coke, and all subproducts of distilled mineral fuel.
- 59,505. PETIN, GAUDET, and Co., Arrangement of metallurgical furnaces.
- 59,528. MARTIN, Special treatment of iron ores.
- 59,529. MARTIN, Conversion of pig-iron into iron and steel.
- 59,530. MARTIN, Apparatus for preparing ores for immediate refining.

PRUSSIA.

PATENTS GRANTED FROM OCT. 2ND TO OCT. 13TH.

- 1. M. GERSTENHÖFER, Roasting furnace.
- 5. P. KULMIZ and C. LÖWIG, Manufacture of carbonate of baryta.

UNITED STATES.

PATENTS ISSUED FROM NOV. 3RD TO NOV. 24TH.

- 40,470. W. GERHARDT, Manufacture of steel.
 40,472. W. GERHARDT, Improvement in purifying iron and steel.
 40,501. J. G. PRANDALL, Machine for grinding ores and amalgamating precious metals.
 40,632. C. LOCKHART and J. GRACIE, Improvements in stills for petroleum.
 40,710. M. S. SALTER, Furnaces for making malleable iron.

SPECIFICATIONS PUBLISHED, AND PRICES.

FROM NOV. 14TH TO DEC. 19TH.

*. * Specifications will be forwarded by post on receipt of price and postage at Her Majesty's Patent Office, 25, Southampton Buildings, London, W.C.—The amount of postage may be estimated from the price, as follows:—Where price does not exceed 1s. 6d., postage will be 1d.; above 1s. 6d., and not exceeding 3s. 4d., it will be 2d.; above 3s. 4d., and not exceeding 6s. 4d., it will be 4d.—Sums exceeding 6s. must be remitted by P. O. O., on Holborn Office, payable to *Bennet Woodcroft*.

- 732 (1863). A. MOREL, Apparatus for generating carbonic acid; 1s.
 753 (1863). I. M. EVANS and W. T. GRIFFITHS, Ventilating mines; 4d.
 2909* (1862). G. DARLINGTON, Manufacture of zinc oxide. (Disclaimer and memorandum of alteration); 4d.
 818 (1863). R. MUSHET, Moulds for casting steel or iron; 4d.
 843 (1863). E. B. WILSON, Manufacture of iron and steel; 4d.
 849 (1863). J. CASSELL, Stills for petroleum; 10d.
 857 (1863). P. HANREZ, Drying coal; 3s. 4d.
 863 (1863). P. SPENCE, Manufacture of sulphuric acid and sulphate of iron; 4d.
 903 (1863). G. FLOW, Boring rocks; 2s. 6d.
 878 (1863). R. A. BROOMAN (com. from J. G. L. BURNET), Manufacture of baryta; 6d.
 884 (1863). J. MOSHEIMER, Crushing, grinding, and dressing metallic ores; 10d.
 920 (1863). W. CLARK (com. from L. N. LANGLOIS), Classifying ores; 10d.

Current Review of Mining, Quarrying, and Metallurgy.

CORNWALL, DEVON, AND WEST SOMERSET.

AFTER a short period of depression, the prospects of Cornish mining have wonderfully revived under the continued advance in the copper standard—an advance that seems founded on a demand that the English smelters find difficult to supply. The position of the tin standard has, indeed, been less satisfactory, and up to the end of the month showed no movement from its recent unsatisfactory and unsettled state; but an advance is daily expected. When this occurs one may assuredly expect a general revival of spirit in Cornish and Devon mining—and a healthy revival since founded on an advance in metals.

With reference to the remarks made in our last respecting the state of the tin market, it is stated that preliminaries have been arranged for a meeting of agents of the principal Cornish tin mines, for the purpose of taking into consideration the most advisable course to pursue to secure a

better price for tin. The existence of differences between certain smelters is assigned as the chief reason for the recent depreciation in the value of this metal.

Some *Falmouth and Sperries* shares were sold by auction in the Vice-Warden's Court at 22s. 6d., the recent call of 1l. paid. A petition for the winding-up of the *Silver Vein Mining Company* (Limited) is to be heard before the Vice-Warden of the Stannaries on the 4th January.

As an example of the amount of labour imposed by share-jobbing with a small number of shares, it may be mentioned that the purser of *New Rosewarne* has, during the last three months, received 683 transfers, representing 2,764 shares, although less than 300 shares have been actually afloat.

It has been resolved to form a new Mining Exchange at Redruth, and the following committee has been constituted to carry out the necessary arrangements:—Mr. J. C. Lanyon (Chairman and Treasurer), Messrs. J. Little, W. McKeand, T. Mills, F. Luke, J. Kendall, A. James, J. Permewan, and J. Davey, jun., Mr. J. H. Cock, Secretary.

Mr. T. M. Pascoe, of Helland, near Bodmin, reports to the *Mining Journal* that he has discovered one of the richest tin lodes in the county by means of the dowsing rod.

Basset and Grylls still continues to open up in such a manner as to fulfil the expectations of its promoters. Tyacke's lode has been struck in driving the cross-cut north of Tyacke's engine shaft, worth 50l. per fathom; and the other parts of the mine are looking well. At *Sithney Carrmeal* there is a promising lode in Bounder's shaft below the 70. *Prosper United* is looking very well, and is making 500l. a-month profit. The lode in No. 1 winze below the 70 is worth 6 tons per fathom, and the 70 west of Hill's shaft is more promising than for some time. *New Rosewarne* has fallen back considerably, and is now reported to be looking poor.

Dolcoath is looking very well. As showing the continued productiveness of that wonderful mine, we may call attention to the fact that in the winze under the 266 the lode is reported worth 200l. per fathom; and as that depth is calculated from the adit which is 30 fathoms deep, the winze is really nearly 300 fathoms from surface. *Wheal Seton* has considerably declined in public estimation in consequence of the sump winze sinking below the 150, referred to in our last as being worth 20 tons per fathom, having greatly fallen off by a horse of killas coming in. *Nanjiles* is reported never to have looked so well as at the middle of the month. The engine shaft was sinking in a good lode, said to be worth 60l. per fathom. At *East Basset* the bunch of copper last discovered is now nearly worked out, but the tin part is reported to be looking well. *North Crofty* is steadily improving. The lode in the 160 and 170 east is worth 35l. and 15l. per fathom, and the stopes in the 150, east of Praed's, are worth 25l., and those west of Petherick's, 20l. per fathom. *South Crofty* is also opening up satisfactorily. In the 120, east of the engine shaft, the lode is worth 10l. to 12l. per fathom; below James' shaft the lode is worth 20l. per fathom. At *East Carn Brea* a promising new lode has been cut in the 50 cross-cut south. *Great Wheal Busy* is reported to be looking well. The lode in the engine shaft is worth 20l. per fathom, and in the 130 east it is valued at 45l. per fathom.

At *West Chiverton* the lode in the bottom of Hawke's shaft is worth 60l. per fathom. On Valpy's lode the 80 west is worth 50l. per fathom. At *North Chiverton* a good branch of lead has been met with in the cross-cut in the 20. *East Russell* is reported to be again improved. The lode in the 120-fm. east is worth 22l. per fathom.

At *West Grylls* meeting (on Nov. 21st) Mr. S. Higgs, jun., was appointed purser in the place of Mr. Hosking, resigned. At *Wheal Buller* special meeting (on Nov. 27th) it was resolved to expedite the further develop-

ment of the mine by draining Whitford's shaft, and to carry on the mine under the same management for two months longer. At *Tincroft* meeting (on Nov. 30th) great disappointment was expressed at finding that the accounts with the London directors have not been closed, and that no satisfactory explanation has been given of the claim made for the 50 shares beyond the number registered. At *North Robert* meeting (on Dec. 7th) the propriety of applying for a total suspension of the dues for twelve months was discussed at some length. Mr. Collier, brother of the present Solicitor-General, one of the proprietors, stated that his brother had reduced the dues upon the ore taken from his part of the estate to 1-18th, and his mother had presented the company with a valuable stream of water, and he did not think the shareholders could complain about dues, the property as an estate having been destroyed. Mr. McCallan said the company had already paid in dues more than the whole property was worth. At *East Russell* meeting (on Dec. 8th) a discussion took place on the allegation that earlier information was obtained by certain persons in the mining market of the changes in the mine than at the office, and considerable dissatisfaction was expressed. At *Wheal Mary Ann* meeting (on Dec. 8th) it was announced that a new sett had been granted at 1-15th. At *North Pool* meeting (on Dec. 15th) it was proposed to purchase and erect a 60 or 70-inch steam-engine, which, with buildings and the development of the undertaking during the year 1864, will involve a further call of 10s. per share; this the proprietors are prepared to respond to, as it was announced in the committee's report under date the 5th August last, and circulated amongst the shareholders. Mr. R. Tredinnick, the manager, presented a report, in which he expressed great confidence that there would be good results. At *East Carn Brea* meeting (on Dec. 15th) it was resolved that the services of a manager be secured in the place of Capt. Glanville. At *Polmar* meeting (on Dec. 16th) a committee was appointed, and it was resolved that the mine be more vigorously worked. The *Penwartha Consols Mining Company* (Limited) propose developing a mine formerly known as Perran Wheal Jane mine. The capital is 12,500l., in 2,500 shares of 2l. 10s. each. The *Grylls Tin Mining Company* propose working on the cost-book system a piece of ground in the centre of Wheal Grylls sett. There are to be 1,024 shares.

We regret to announce the death of Mr. Richard Lanyon, of Kennal Vale, which took place on December 8th. Mr. Lanyon was well known as the partner and representative of the Kennal Vale Powder Company; he was also one of the committee of Dolcoath, and perhaps one of the largest mining adventurers in the county. Among the mining interest his loss will be much felt.

WALES AND THE BORDERS.

SOUTH WALES.—The iron trade has shown great firmness during the past month, and if the improvement which has taken place continues, it is expected that there will be another advance in the price of iron. Furnaces which have been out of blast for some time are being relighted, and makers are so well supplied with orders for two or three months to come that they refuse to take more, unless subject to future changes in the market. A good trade has also been done with foreign ports, and some large consignments have been made to America. The masters are beginning to feel great inconvenience from the want of first-class hands, emigration, mostly to the Northern States, where high wages are given, having carried off a large number of operatives.

It is said that the Millwall Company have purchased the Brynna estate

with the intention of putting the furnace erected on it into blast. The Aberdare and Merthyr ironworks are well employed, and the announcement of the Penydarren works being about to reopen has given an impetus to the trade of Merthyr. Messrs. Weston and Grice of West Bromwich have, it is stated, commenced working at Cwmbran, where a large quantity of iron has already been turned out. It is also reported that Messrs. Fothergill, Hankey, and Baker, the new proprietors of the Plymouth Works, Merthyr, have been making great changes in the management of these works, and have discharged about 150 workmen, who, however, readily found employment elsewhere. The Rhymney Iron Company are erecting a mill for the rolling of armour plates, for which there is likely to be a good foreign demand. The Varteg and Golynos furnaces have been blown in by Messrs. Partridge and Jones, and Messrs. G. E. Bevan and Co.; and part of the Llanely works, Breconshire, has been converted into a tin-plate manufactory, by Messrs. Jayne and Meadhouse.

The activity in the steam-coal trade still continues greatly to increase, and there has also been a better demand for house-coal. The results of the experiments made by the Admiralty at Devonport have given great satisfaction, and will no doubt cause the South Wales steam-coal to command a much higher market than hitherto. Its export trade is daily enlarging, and the docks are full of vessels waiting for cargoes. The traffic receipts of the Taff Vale and Vale of Neath Railways for the present year show a great excess as compared with those of last year, which may be regarded as a sign of the general activity of the districts. There is an increased demand for coke, which is now largely made, and several additional ovens are being built at some of the collieries for this purpose. At the beginning of the month the Monmouthshire colliers applied for an advance of 2*d.* per ton on the prices at present paid them for cutting, and it is generally believed that the coalmasters will grant it, and at the same time make a corresponding rise in the price of coal. Complaints are made by the masters that the colliers do not turn out sufficient coal, and there is no doubt that the latter still continue the practice of restricting the supply by working less time, thus putting their employers to great inconvenience. The workmen belonging to Craig-yr-Allt colliery, near Cardiff, the property of Messrs. Booker, have resumed work upon the terms of their masters, operations having been suspended since July last.

During the month of November there were 166 vessels, with an aggregate registered tonnage of 14,457 tons, engaged in the trade of Neath, against 186 vessels with a tonnage of 13,465 tons in the corresponding month of last year. The exports were 17,725 tons of coal, coke, and culm; 1,041 tons of bar iron, and 134 tons of copper, making a total of 18,800 tons. The imports for the month were 3,803 tons of iron ore, 2,816 tons of copper ore, and 1,042 tons of pig-iron, making a total of 7,661 tons. As compared with the corresponding month last year there was a *decrease* of 127 tons in the imports, but an *increase* of 121 tons in the exports. 381 vessels with a tonnage of 53,332 tons were engaged in the trade of Swansea during the month, and the shipping rates received amounted to 1,433*l.* 19*s.* 11*d.*, being a slight *increase* in the tonnage and receipts as compared with the corresponding month of 1862.

Among the arrivals into Swansea were:—Iron ore from Cherbourg and Hondekliip; copper ore from San Sebastian, Lisbon, Havre, Wallaroo, Aveiro, Taltal, and Cuba; and copper regulus from Cuba.

The returns of the bill of entry at Cardiff for November show that during the twenty-five working days of that month there had been exported 138,394 tons of coal, 6,136 tons of iron, 3,037 tons of patent fuel, and 144 tons of coke. The number of vessels employed was 437. The total quantity of coal and iron shipped during the eleven months of this year has been 1,356,247 tons of coal and 205,544 tons of iron; in the same period of 1862

it was 1,212,738 and 165,441 tons respectively; and in 1861, 1,031,217 tons of coal, and 124,172 tons of iron. Of the ships sailing in November 101 were British, 106 French, and 40 Italian.

On December 15th an accident occurred at the Carngethin colliery, Blackwood, Monmouthshire, by which two men were killed and five others seriously injured. The accident arose through the pit rope getting off the drum, and the carriage running down to the bottom of the shaft. The pit is sixty yards deep, and if a break had not been applied, which to some extent checked the velocity of the descent, there is but little doubt that all the seven men would have been killed.

The Cwm Cappel colliery was submitted for sale by public auction, but was "bought in" for 900*l*.

The *Llanrhidian Bituminous Colliery Company* (Limited) is announced, with a proposed capital of 100,000*l*., in 20,000 shares of 5*l*. each, of which one-half are to be issued in the first instance. The property to be worked is situated in Glamorganshire, and is stated to contain ten workable seams of highly bituminous coal, besides an abundance of argillaceous iron ore of excellent quality.

At a special meeting of the *Neath and Pelenna Colliery Company*, a resolution was passed authorising the directors to grant a lease of the ironstone under the company's estate, for which favourable terms have been offered.

CARDIGANSHIRE.—The prospectus is also issued of the *Darren Consolidated Silver and Lead Mining Company* (Limited). The Darren Consolidated Mines, which this company proposes to purchase and work, are situated about 6 miles from Aberystwith. The capital is fixed at 30,000*l*., in 15,000 shares of 2*l*. each. The first issue is to consist of 7,500 shares.

The *Llandewibrefi Lead Mine Company* has given a prospectus. The proposed capital is 12,500*l*., in shares of 1*l*. each.

GLOUCESTERSHIRE AND SOMERSETSHIRE.—The Hill House Estate, situated about 4 miles from Bristol, was offered for sale on December 11th, by Messrs. Norton, Hoggart, and Trist, and was sold for upwards of 29,500*l*. The Bristol coal-measures lie under the estate, and the existence of a deposit of hematite iron ore has been lately discovered. The collieries and ironworks in the Forest of Dean, the property of the late Mr. Benjamin Gibbons, jun., have been purchased by the firm of Messrs. Gould Brothers. They include the King's Moor, Noxon Park, Easter, and Tyngle's Level Iron Mines, and the two blast-furnaces at Sewdley. The coal and iron trades in the Forest—especially the former—are exceedingly brisk, and the colliers at present contented with their wages. An extensive field of iron ore has lately been discovered on an estate at Frampton Cotterell, near Bristol. This estate, consisting of about 9 acres, produces ore to the extent of 300 tons a week.

Among the imports into Bristol have been:—200 tons of mineral ore from Leghorn; 370 tons of pig-iron from Glasgow and Belfast, and 176 pieces from Archangel; 13 barrels of sulphur and 105 boxes of lead ore from Liverpool; 32 tons of lead ore from Newquay; 325 cantars of sulphur from Palermo; 210 tons of sulphur ore from Pomaron, and 72 tons from Dublin; 80 tons of sulphate of lead from Runcorn; and 20 tons of iron from Waterford. The exports include:—881 tons of coal, 516 tons of iron, and 16 tons of copper. During November, only 316 tons of coal and 459 tons of iron were exported oversea from Bristol, against 981 tons of coal, and 4,261 tons of iron in October, showing a decrease of 665 tons of coal, and 3,802 tons of iron.

The imports into Gloucester include:—210 tons of coal from Llanelly, 60 tons from Saundersfoot, 86 tons from Swansea, and 50 tons from Landshipping; 100 tons of sulphur ore from Pomaron; 40 tons of iron from Swansea, and 40 tons from Briton Ferry. Among the exports may be mentioned:—238 tons of iron, and 230 tons of coal.

NORTH WALES.—An explosion took place on December 9th, in the Green Pit, Ruabon, the property of the *British Iron Company*, resulting in the death of ten persons, and injuring several others. The cause of the accident has not been exactly ascertained, but it is supposed to have occurred during the act of blasting. Another explosion occurred at the same colliery on December 16th, by which twelve lives were lost, and several of the colliers seriously injured.

ISLE OF MAN.—The *South Foxdale Silver Lead Mining Company*, with a capital of 25,000*l.*, in shares of 5*l.* each, has issued its prospectus. The sett includes the Ballycorkish Mine, and is upwards of 4 miles in extent; it is situated between Castletown and Port St. Mary, to the south of the Foxdale Mines, and possesses great facilities for shipping. The purchase-money has been fixed at 7,500*l.* in shares of the company.

MIDLAND COUNTIES, SOUTH LANCASHIRE, AND SOUTH YORKSHIRE.

STAFFORDSHIRE AND WARWICKSHIRE.—In the early part of the month there was great excitement in the iron trade, which still continues in an unsettled state. Some of the masters are anxious for an advance of 30*s.* while others only wish prices to be raised 1*l.* There has been a large demand for all kind of iron, but no orders accepted unless subject to the prices which may be fixed at the ironmasters' meeting, many of the makers having a sufficient number on their books to last for two months, and some for even a larger period. Messrs. Schneider and Hannay's pig, and that of the Kirkless Hall Company, is now quoted at 50*s.* America continues to give large orders at advanced rates. Proprietors are, it is said, making arrangements to re-light all furnaces at present out of blast, thereby greatly enlarging trade in these counties, and as a larger quantity of raw material will of course be required, contracts are being entered into with the proprietors of stone and coal mines, in which seams of stone have lately been discovered, which, properly mixed with other sorts, is stated to produce very fair iron. The price of pig-iron has not been so high as at the present time since the beginning of 1855. Large transactions have also taken place in ironstone, of which there is but little left in the market. Complaints have been made by ironmasters that they are unable to obtain a sufficient supply of fuel, and it is even feared that some of the furnaces will with difficulty keep in their fires at the present time, as the colliers, since they have received higher wages, do less work than usual. The 500 limestone quarrymen that have been on strike for several weeks through the district of South Staffordshire and East Worcestershire resumed work on December 22nd, the masters having consented to give them the full advance of 6*d.* per day. The ordinary wages of a limestone getter have been 3*s.* per day, but some time ago they obtained a rise of 6*d.*, and now they have succeeded in getting a further rise of 6*d.*, making their present wages 4*s.* per day. The limestone loaders have also obtained an advance of 1*s.* per day on the ordinary rate of wages, they are now, therefore, receiving 5*s.* 6*d.* per day.

The coal market remains firm, with a brisk demand, but the supply has been falling off instead of increasing, on account of the colliers turning out so little coal.

Mr. Wm. Barrows, of the Bloomfield Ironworks, Tipton, Staffordshire, died suddenly at the railway-station, Stafford, on December 10th. Mr. Barrows was one of the largest ironmasters in South Staffordshire, and for many years partner with the late Mr. Joseph Hall. The name of the firm is well known in connection with the "BBH" iron.

DERBYSHIRE.—The Staveley collieries and ironworks at Chesterfield, Derbyshire, so long known as the property of Mr. Richard Barrow, have just been sold to a joint stock company, which has been formed in Manchester, through Messrs. Chadwick, Adamson, and Co. The value of the property exceeds half a million sterling, and the company intend to erect rolling mills and forges.

The *Staveley Main Coal Company* has issued its prospectus. The capital is to be 60,000*l.*, in shares of 10*l.* each. The property proposed to be worked is the West Staveley Colliery, from 200 to 300 acres in extent.

SOUTH YORKSHIRE.—The coal trade has been very brisk all through the month. The pits are doing a large business, and some of the collieries are unable to supply all orders, the demand being so great. The iron trade continues to improve, and orders from the Continent are considerable. There has been an active inquiry for armour plates, and new works are being built for this particular kind of manufacture.

An accident occurred on November 30th, at Thryberg Hall Colliery, near Rotherham, caused by the cage, containing six men, being tilted over, the men being precipitated to the bottom of the shaft and killed.

SOUTH LANCASHIRE.—Very great activity has prevailed in the coal trade, which has not been in such a prosperous condition for two years past. Some of the colliery owners are already paying their men an increase of wages, and the rest of the colliers will shortly commence working at the advanced rate. At a meeting of the Wigan colliery proprietors, held at Liverpool on November 30th, it was resolved to raise the price of coal 1*s.* per ton, and this advance has been generally obtained by them. The iron trade has been flourishing, as also the smelting trade. All the copper works are fully employed, and additional ones are being started at Sutton. Trade in general is in a satisfactory state in this district.

NORTHERN COUNTIES. NORTH LANCASHIRE AND YORKSHIRE.

NORTHUMBERLAND AND DURHAM.—The coal trade has been steadily improving, though it is not yet in as flourishing a state as could be wished, and there has been a brisk demand for coke. The pits have been working full time, and there is a good supply of coal for shipment. The returns of the foreign coal trade for November show a larger increase than usual. The returns of coal and coke exported from the Tyne and Wear have greatly decreased during the present year, owing to the large shipments that have been, and continue to be made from Cardiff. The Tyne is also doing a much smaller trade with Germany, the markets there being now largely supplied with coal from the interior. The question of the strike at the Auckland collieries is not yet settled. Messrs. Straker and Love have issued a notice stating that they will employ none belonging to the union and although a deputation waited upon them to effect a compromise if possible, they are fully determined to adhere to this resolution. The men on strike, with a few exceptions, are very orderly.

The engagements of the house of Mr. W. M. de Mattos, of Leadenhall-street, were dishonoured on the afternoon of December 8th. Its business was chiefly connected with the shipment of coal, and the coal owners in this district especially are very heavy losers.

The iron trade has been making a very satisfactory progress; manufactured iron, particularly plates, has been in good demand, and prices have had an upward tendency since the beginning of the month. It is hoped that the Consett district is again going to look up, as it seems that the business of the Derwent Iron Company has largely increased of late, and considerable additions are being made to the works. Two of the

Crook Hall furnaces have been blown in, and the machinery connected with them is undergoing repair and replacement, while two of the Bradley furnaces are to be started shortly, it is said, by Messrs. Palmer Brothers and Co., of Jarrow, at Middlesborough. Messrs. Hopkins and Co. are proceeding rapidly with their four new furnaces. The blast-furnaces at Felling are to be reopened, a quantity of ore having been stored there, and it is stated that Sir William Armstrong intends building two furnaces at Elswick, for the purpose of smelting the Redesdale and other ores, from which a superior kind of iron is expected to be made.

The exports from the Tyne include:—156,416 tons of coal; 10,434 tons of coke; and 61,643 cwt. of iron. The imports during the month comprise:—12,692 bars of lead from Carthage, and 2,680 from Alicante; sulphur pyrites from Rotterdam and Dordt; sulphur ore from Pomaron; a cargo of manganese from Huelva; a cargo of lead ore from Cagliari; 150 tons of iron ore from Garrucha; and cargoes of iron and lead from Gothenburg.

SCOTLAND.

There has been a fair amount of business transacted in the coal market during the month. It is stated that the duty on coal imported into France is to be lowered in February next, in order to make it uniform, and a greatly increased export of coal and coke is consequently expected.

The price of iron has been steadily advancing, and first class common bars are not now to be had under 9*l.* per ton, many of the makers refusing orders even at this rate. There was great excitement in the pig-iron market at the beginning of the month, and prices advanced, but declined again in consequence of an alarm caused by the rise in the Bank rate; they have however since improved. The exports of pig-iron during the present year show a considerable increase. The following are the shipments for the first eleven months of the last four years:—

Month.	1863.	1862.	1861.	1860.
	Tons.	Tons.	Tons.	Tons.
January.. .. .	30,467	44,729	39,267	38,625
February	38,867	39,614	33,070	26,883
March	50,909	44,495	33,474	39,152
April	57,345	63,160	62,622	50,585
May	67,820	70,461	82,036	66,701
June	53,806	42,167	57,201	40,712
July	51,181	41,581	48,304	47,848
August	59,534	57,025	54,460	64,216
September	56,153	49,079	39,516	52,697
October.. .. .	58,753	84,375	47,766	37,908
Week ending Nov. 1 ..	14,294	6,005	13,345	11,429
" " 8 ..	9,023	9,062	9,972	10,072
" " 15 ..	10,152	8,413	9,638	8,698
" " 22 ..	9,409	9,615	10,249	11,351
" " 29 ..	9,678	12,777	7,700	10,595
Total	577,391	522,558	546,940	517,370

The shipments of November were thus, 52,556 tons against 45,872 tons in the corresponding month of 1862, 51,204 tons in the corresponding month of 1861, and 52,045 tons in the corresponding month of 1860.

At a meeting of puddlers, millmen, and members of other branches of

the iron trade in the West of Scotland, held at Glasgow on November 30th, it was resolved that they should unite themselves with the National Association of England, in order to protect themselves against the encroachments of men who had been treating them improperly for some years past.

For some time past workmen have been engaged sinking a new shaft in search of coal, about a mile north from Scremerston, and it is stated that they have found coal of a superior quality at a depth of 68 fms. The seam yields top coal, 17" thick, of first rate quality; band-stone, 2' thick; ground coal, 16" thick; and curving, 6½" thick, of first-rate quality. The pit which is situated on the Greenwich estate has been named Scremerston Colliery No. 16.

CONTINENT OF EUROPE AND MEDITERRANEAN COUNTRIES.

FRANCE.—The iron trade has been dull, and prices have fallen, which is rather surprising, considering the advance that has been established both in England and Belgium, but it is hoped that this state of things will soon improve, and that orders will come in faster than has hitherto been the case. The importation of iron during the present year has greatly fallen off; in September and October it was only about four cwts. in each month. The Franco-Belgian Company, of Vézin-Aulnoye, has applied to the Government for power to establish rolling works near Nancy, and it is proposed subsequently to erect blast-furnaces. This company already possesses two furnaces in blast, one at Noveaut, and the other at Aulnoye, near Maubeuge. The Paris, Lyons, and Mediterranean Railway Company has contracted with the Creuzot Works for the delivery of 100,000 tons of rails. The firm of Wendel, which is considered to be first in rank as regards the manufacture of rails, has received an order to supply the new Charentes and Medoc Railway Companies with about 33,000 tons.

It appears that, notwithstanding the great exertions which French capitalists and politicians have been making of late years to extend the indigenous coal production of France, and to substitute French for English coal in the Imperial Marine, the deliveries of English coal into the French empire during 1863 promise to attain a very considerable total. Our neighbours evidently cannot get rid of our coal, the Pas-de-Calais and the Nord notwithstanding. The importation of English coal into France first acquired importance about 1840, when France began to make industrial and manufacturing progress in common with the rest of Europe. In 1840 the total imports of our coal into France were 381,000 tons; five years later this total had risen to 566,000 tons; in 1850 a further advance was made to 602,000 tons, and in 1855, notwithstanding some difficulties arising from the absorption of shipping in the transport of troops and stores to the Crimea, to 881,000 tons. The next four years presented a period of continuous progress, until in 1859 the imports reached an aggregate of 1,396,000 tons, while Belgium, in the same period, delivered to France 3,340,000 tons. Although the indigenous coal production had risen from 3,003,000 tons in 1840 to 7,483,000 tons in 1859, and, although Belgium sent far more coal to France than England, lingering national prejudices were aroused, a great outcry was raised against the employment of English coal in the Imperial Marine, and the result was that in 1862 the deliveries of English coal at the French ports declined to 758,000 tons, showing a falling off of 638,000 tons, as compared with 1859, while the product of French coal-workings rose in 1862 to 9,400,000 tons. But this year, although the yield of these mines is expected to attain a clear 10,000,000 tons, the demand for English coal has been reviving, and the total imports from Jan. 1 to Sept. 30 amounted to 926,189 tons, being at the rate of 1,234,918

tons per annum. Belgium sent France at the same time 1,927,490 tons, being at the rate of 2,569,986 tons per annum, and from other sources 477,632 tons have been received, or at the rate of 636,869 tons per annum. Comparing, then, matters as they will probably turn out in 1863, with the actual course of affairs in 1853, the following results are arrived at:—

	1853.	1863.
	Tons.	Tons.
Indigenous French production ..	5,938,000	10,000,000
English supplies	666,720	1,235,000
Belgian supplies	2,431,340	2,570,000
Other supplies	432,000	637,000
Total	9,468,060	14,442,000

In expression "other supplies" are included the receipts from the Zollverein. It results from the figures given—which, of course, as regards 1863, are, to some slight extent, conjectural—that while in 1853 France had to import 3,530,060 tons of coal to supply her wants, she will require, probably, in 1863, 4,442,000 tons of foreign combustible to meet her industrial requirements, although in the current year her indigenous production will be at least 4,000,000 tons more than in 1853. It is, of course, undesirable that we should lose any outlets for our products; but, after all, our export of coal to France is not a matter of vital national importance. Thus, while in 1862 the total production of coal in England was estimated at 81,638,000 tons, the exports to France amounted to 758,000 tons and to all countries to 7,671,670 tons, less than 10 % of the quantity made available by the labours of our miners. In 1858, the coal production of Great Britain amounted to 65,008,000 tons; in 1862, to 81,638,000 tons, showing an increase of 15,630,000 tons in four years, or more than twice the whole of the exports, and more than the whole consumption of France from all sources, home and foreign.

BRUXELLES.—At the meeting of Belgian ironmasters held at Brussels, it was decided that present prices be firmly maintained. The state of the iron trade is satisfactory, the works having been fully employed, in consequence of the numerous orders received. A second furnace belonging to M. Dupont has been put into blast at Châtelineau for the manufacture of casting pig, and it is reported that another will be relighted at Anvers. The Ougrée establishment has just concluded a contract with some local works for 6,000 tons of pig at higher prices than have been hitherto asked.

Freights have been considerably reduced in the coal market, and there has been a slight increase of orders.

THE ZOLLVEREIN.—Some official documents have been issued showing the mining and metallurgical production of the confederation for the year 1861. The States which compose the Zollverein are Prussia, Anhalt, Lippe, Waldeck, Luxembourg, Bavaria, Saxony, Hanover, Wurtemberg, Baden, Electoral Hesse, the Grand Duchy of Hesse, the States of Thuringia (Weimar, Oeburg, Meiningen, Altenburg, Schwarzburg, and Reuss), Brunswick, Oldenburg, and Nassau.

The total produce of coal was 14,133,048 tons, of the value of 4,039,070*l.*; lignite, 4,622,312 tons, of the value of 665,245*l.*; combustible mineral of every other kind, 2,542,530 tons, of the value of 1,641,128*l.*; pig-iron, 531,786 tons, of the value of 2,270,028*l.*; steel pig, 10,685 tons, of the value of 66,988*l.*; casting pig, first fusion, 49,122 tons, of the value of 477,973*l.*; iron, 354,745 tons, of the value of 3,710,294*l.*; and steel, 34,258 tons, of the value of 823,817*l.* The number of workmen employed in the

mines of the confederation amounted to 167,538; and in the ironworks' 77,453.

It is stated that the whole of the works and plant of the Alexis Foundry, lately the property of the Bentheim-Lingen Society, and situated at Bentheim, near the Lingen Railway, in Hanover, are to be offered for sale on March 19th.

The *Neustadt Charcoal Ironworks Company*, with a capital of 230,000*l.*, in shares of 20*l.* each, has re-issued its prospectus, which states that upwards of one-third of the capital has now been subscribed for.

It appears that the quantity of coal raised in Prussia in 1862 was 13,088,391 tons, of the value of 3,384,758*l.*; and of lignite, 3,807,050 tons, of the value of 499,860*l.*; making a total of 3,884,618*l.* Ores of all kinds were raised to the value of 1,088,173*l.* The quantity of iron was as follows:—

Pig.. .. .	tons	491,825	£1,938,364
Steel pig	"	7,768	44,228
Casting pig, first fusion	"	26,484	238,577
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Total	"	526,077	2,221,169
Iron	"	330,999	3,479,511
Steel	"	22,065	321,661
Other metals occupied the following position:—			
Zinc	tons	59,763	953,059
Silver	lbs.	37,695	205,678
Gold	"	—	21
Lead and litharge	tons	22,871	428,406
Copper	"	2,582	240,342
Cadmium	lbs.	226	51
Nickel	tons	275	69,150
Arsenic	"	223	29,817
Antimony	"	60	375
Finally miscellaneous products yielded the subjoined totals:—			
Alum	tons	3,010	31,528
Copperas	"	1,857	6,513
Sulphate of copper	"	175	1,915
Sulphur	"	373	3,423
Salt	"	176,248	258,952

The total value of the products obtained was, therefore, as follows:—Coal and lignite, 3,884,618*l.*; products of the blast-furnaces, 2,221,169*l.*; other products (metals and salts), 2,232,228*l.*; making a total of 8,338,015*l.* The number of workmen employed in the mines of coal and lignite was 81,092; in the other mines, 41,189; and in the ironworks and saltworks, 67,872; or, altogether, 190,069.

NORWAY AND SWEDEN.—At the annual general meeting of the *Allen and Quenangen Mining Company*, the report of the directors showed that the expenditure during the year has been 11,004*l.*, against 14,658*l.*, in the year ending June 31, 1862, showing a reduction of 3,654*l.* The returns have been 127½ tons of copper, estimated to realise 11,500*l.*, against 115 tons, valued at 10,400*l.* in the previous half-year, showing an increase of 1,100*l.* During the past year the mines on the whole have improved, and the yield of copper has increased.

The *Norwegian Copper Company*, with a capital of 100,000*l.*, in shares of 2*l.* each, has issued its prospectus. The object of the undertaking is to develop two mineral deposits, extending over several thousand acres, near the seaport of Drammen. The property, which is held direct from the Norwegian Government, free of all royalty, at the nominal rental of 30*l.* per annum, is to be acquired by the company for 20,000*l.*, of which 4,000*l.* is to be in cash, and the remainder in paid-up shares.

RUSSIA.—In the year 1850 a Frenchman, named Sabatier, erected some smelting works near Mourom, about 200 miles east of Moscow. The pig produced was excellent, and allowed of a second fusion as a mixture with other pig less rich in carbon. The production of the blast-furnace was at first four to six tons per day of twenty four hours. The ore from which the pig-metal is derived is carbonated manganiferous iron, of a colour varying from a clear greenish grey to deep grey, and from grey brown to deep reddish-brown; it is generally raised only in winter, when the water is in part drained off, and when the surface of the soil, frozen often to a depth of nearly 7 feet, gives great solidity to the sides of the pits. Some improvements were made in the works in 1855, and the production of the blast-furnace was extended so as often to attain a total of nine tons per day; but this reduced the quality of the metal, though, according to consumers, it remained the same as regards the production of wrought-iron.

ITALY.—The first annual general meeting of the *Vallanussca Gold Mining Company* was held on December 16th, at which it was stated that the prospects of the undertaking appear to be very satisfactory. Nearly all the ores produced from the mines contain remunerative quantities of gold, and are said to yield from 7 dwts. to 1 oz. of gold per ton.

NORTH AMERICA.

CANADA.—The *Quebec Gazette* states that a vein of antimony has been discovered in the township of South Ham.

The *English and Canadian Mining Company* have received reports for October. A poor piece of ground had been met with in the 30-fm. level. A pile estimated at 22 tons had been sampled, and another 20 tons would have been sampled but for a breakage. Every effort was being made to get the ore ready shipped before the closing of the navigation.

NOVA SCOTIA.—Advices from New York describe considerable excitement in that city respecting the gold workings of this province, of which most glowing accounts are given.

The adjourned first ordinary general meeting of the *Nova Scotia Land and Gold Crushing Company* was held on the 16th. The directors report stated that, acting under the advice of Messrs. Phillips and Darlington, who had twice inspected their properties, their chief mining operations were being carried on at Oldham and Sherbrooke, where their land would be able to keep the crushing machines in full operation. At Wine Harbour, where the company had also erected machinery, a good crushing business was already being opened up. The mining prospects both at Oldham and Sherbrooke were truly excellent. About 112 ounces of gold, the produce and earnings of the company's crusher at Sherbrooke, had been received and realised. The operation of the existing laws affecting the search and mining for gold being in several particulars obstructive to efficient mining, the directors had brought the objectionable points under the notice of the colonial government, in the hope that they might be rescinded or modified. In the interim between the past and present meetings Mr. Phillips, who had visited Nova Scotia, had placed the property in such a position as to produce a more immediate result than could have been otherwise obtained. In undertakings of this kind the expenditure was in the first instance always on one side, large amounts having to be laid out in machinery, &c., and therefore anything like a result could not be expected at present. The outlay on mining operations had up to the present time been 2,000*l.*, and the return already received amounted to 500*l.*, which, considering the short time of working, the directors regarded as very favourable.

LAKE SUPERIOR REGION.—Advices from Keweenaw Point report that

a good business is being done all along this mining range, and that there seems to be better prospects for mining companies to have paying mines than has been the case for some years. At Copper Harbour there is now a population of 300 men, whilst last year there were but 30. At the *Star* mine, 60 men are working, erecting a stamp-mill, and also a tram-road to the stamps, which will be in full operation early in March. These stamps will be worked by very powerful water-power, derived from the Montreal River, which has been dammed by this company. Immediately west of the *Star* Company the *Hanover Mine* Company are actively pushing on exploring operations. A large vein has also been opened on in Section 10, more generally known as *Copper Harbour* Mine; and several other fine prospects have likewise been opened on during the summer. As an evidence of the importance in which this district is held, we may mention that a mining site of 40 acres, located at Keweenaw Point, has been sold at New York for \$90,000.

The *Humbolt Copper* Company has, it is stated, purchased the property of the late *Humbolt Mining* Company, consisting of about 1,100 acres of land chiefly upon the Mineral Range, with a mile of frontage on Lake Superior. This property is crossed by several veins of copper running north and south, and also, for more than a mile, by the east and west formation, known as the Ash Bed, worked in the adjoining mines of *Copper Falls* and *Phoenix*: \$90,000 have been expended on the property, exclusive of the original purchase. The works were suspended in the autumn of 1860, on account of financial difficulties, but operations will shortly be recommenced.

The *Metaline Land* Company is said to be carrying on explorations on Sections 1 and 12, in Town 58, north of Range 28 west, some large veins being known to pass through them, which they intend to explore in order to ascertain their exact value. The *Phoenix* and *Bay State* Mines have also reported that their operations are going on satisfactorily, and it is thought that a good shipment of copper will be made this season.

The shipments of iron from Marquette up to Oct. 23rd amounted to 175,877 tons.

UNITED (ATLANTIC) STATES.—The quantity of oil produced annually from the Pennsylvania oil wells is estimated at from 1,000,000 to 1,800,000 barrels. The wells have been producing at this rate for about three years. During this period the price of the oil has ranged from 25c. to \$7.00 per barrel at the wells. The producing portion of Oil Creek valley is a flat, 80 rods wide, extending from the mouth of Oil Creek to Titusville, a distance of 17 miles. No oil of any consequence has been produced at a greater distance from Old City than 10 miles. The oil wells average from 450' to 500' in depth; and their capacity may be judged from the fact, that from the Maple Shade well have flowed for some time past 1,000 barrels of oil per day. Nearly half a million dollars worth of oil has been taken from that well alone. The number of oil refineries in Oil City is 40, and many more are being constructed.

The production of anthracite coal this year to the close of navigation in December, from the Pennsylvania mines, is likely to reach the high figure of 9,000,000 tons—1,000,000 more than was ever before brought to market in one year, and 1,500,000 in excess of the amount obtained in 1862. The annual production of the same mines 30 years ago was only 300,000 tons; at the present time that quantity would not supply one-quarter of the demand for Government service, while the necessities of private consumers would exhaust the 300,000 tons in a few days.

The quantity of coal exported from Erie City, from January to November 1863, amounted to 160,853 tons, and the quantity of iron ore imported during the same time was 47,005 tons,

At Whiteside, in the vicinity of Chattanooga, the present focus of the civil war, there are several coal mines, which are shortly to be worked on Government account. The seam in work crops out perhaps 500' above the valley, and is from 4' to 8' thick. It was from that and the mines on the Cumberland range that the Confederates obtained their fuel. They are called the Etna, Whiteside, and Raccoon mines, and are fully well supplied with railway, shoots, tramways, and carts for doing a large business. The valley and the sides of the mountains are inhabited by colliers from Wales, and there is but little fear that enough can be mined to supply the wants of the troops at Chattanooga and elsewhere, and to keep the steamers moving on the river as long as there shall be occasion to use them.

Mr. W. Gemmell, of Manchester, has communicated to the *Mining Journal* a rather laudatory account of the Cumberland coal region in Maryland, in which he states himself and his friends to be largely interested. He describes the region as being situated at the western point of Maryland, on one of the spurs of the Alleghanny mountains, which may be called the back-bone of North America, running as they do nearly north and south through the centre of the states. On the west side of this back-bone the great deposit of bituminous coal exists; and on the east the great deposit of anthracite or stone coal—these two deposits being the largest in extent and the best in quality of their kind that are known. The Cumberland coal region is on one of the eastern spurs; and is the only bituminous coal that is known to exist, and, from the geological formation of the country, that can exist east of the Alleghannys. Its thickness (the big seam) is from 10 to 18 ft., lying nearly horizontal, generally above the water level, and workable from sides of the hill, quite undisturbed by dykes or faults. Its quality for raising steam, blacksmiths' purposes, and making iron is unsurpassed, and there is hardly a trace of sulphur in it. The distance from sea-board is about 200 miles, by railroad, from Baltimore, and about the same distance by the canal from Georgetown and Washington. In July last land could have been purchased, with the big seam of coal in it, for \$300 to \$500 an acre. There are 15,000 to 25,000 tons of coal of this seam in each acre, and there are several seams of from 3 to 6 feet beneath it, and below the water level. The coal can be placed just now f.o.b. at Baltimore, by railroad all the way, for \$4.50, and by the canal f.o.b. at \$4; prices at last date were \$6.50 and \$6 respectively. These profits are exceptionally large, for the usual rate is 50 c. per ton. The wages paid the miners is 50 c. per ton for mining (before the war it was 30 c.). They can dig 6 to 10 tons a day, and make \$3 to \$5. He considers that 50,000 tons annually can be sent to sea-board after an incline to the railroad is made, headings driven, plant for transport provided and houses erected.

WESTERN (UNITED) STATES.—A correspondent of the *Missouri Democrat* in describing the Iron Mountains of Missouri divides them into Iron Mountain, Pilot Knob, Shepherd's Mountain, and Russell's Mountain. The Iron Mountain he describes as of an oblong shape, extending north and south, being about four miles in circumference at the base, and rising about 200 feet in elevation above the level of the valley. It consists of a vast mass of iron ore, the surface being covered to some depth with loose fragments of ore—which extends downwards to an unknown depth as shown by the village at its base. The Pilot Knob seven miles south of Iron Mountain is about two miles in circumference, and 600 feet high; and also consists of a great mass of iron ore, which however is so mixed with silicious matter as to cause great loss of metal in the cinder, which is sometimes nearly as heavy as the ore itself. The iron made from it, however, he describes "as of a very superior quality, in fact almost as fine as steel; the ore being of that character termed pipe ore." Shepherd's

Mountain, immediately west of Pilot Knob, across a small valley, is about four miles in circumference, and 630 ft. high, and is similarly described as consisting of a vast mass of iron ore. Russell's Mountain, seven or eight miles N.E. of Pilot Knob, seems also to be of equal importance.

Silver-lead explorations are reported to be going on actively in Upper Michigan.

SOUTHERN STATES.—An important discovery of rock salt of great purity has been made in the island of Petite Anse, in Vermillion Bay, on the Gulf Coast of Louisiana. It does not appear, however, that any steps have been taken as yet to utilise it, although there is a large demand for salt for chemical purposes alone in the neighbourhood of Virginia City.

CALIFORNIA AND BORDER TERRITORIES.—It is said that the receipts of gold dust at San Francisco from the interior amounted during the year 1862 to £8,507,960. New mines are constantly being opened up in the State, while the neighbouring Nevada territory is proving rich in silver and gold, over nearly her whole extent, and Arizona bids fair to rival the California of 1849. It is estimated that the Rocky Mountains will this year produce £20,000,000 of gold. The Quicksilver Mining Company of California had settled in full with the old Almaden Company, to whose property they succeed, under the late decision of the Supreme Court of the United States. The Company acquire peaceable and perpetual possession of the estate at a cost of \$1,750,000 (350,000*l.*), payable by instalments mutually accommodating. The first payment—\$250,000 (50,000*l.*)—in gold was made at the time of settlement. The Company has made a further payment in gold to the amount of \$600,000 (120,000*l.*). In the first instance the payment was to Messrs. A. Belmont and Co., whose correspondent in San Francisco advanced the money. The second payment was advanced by Messrs. Wells, Fargo, and Co., in San Francisco. A payment of \$150,000 (30,000*l.*) is to be made in California out of the avails of the mine for the present season, leaving \$750,000 to be paid in three equal annual instalments, in 1864, 1865, and 1866.

The Freemont estate, in Mariposa county, is reported to have been sold lately for \$6,000,000, the gold-bearing quartz it contains being the cause of such a large sum being paid for it. Twenty-seven gold-bearing veins are known, and it seems probable that there are hundreds more to be discovered. The aggregate yield of gold in 1861 amounted to \$634,217; and in 10 months of 1862 (during which year the principal mill was long idle) the yield was \$412,290.

There is a very favourable report from the mines of Calaveras county. Discoveries of placer washings have recently been made in a district of about six miles in extent between Mokelumne Hill and the Calaveras River; many claims here realising \$1,000 a month profit. The dirt in this district is all crushed before washing, the only safe means of getting all the gold out of a hard-cemented tough clayey dirt. The vein workings are of inferior importance, but several veins are now working remuneratively, and this branch is rising in public favour. Water being of great importance here, the whole county is a net-work of flumes and ditches, from which water can be obtained at the rate of 40c. per inch.

At the *New Almaden* Quicksilver mine, 150 men are at present employed, working at an average depth of 80 fms. According to the *San Francisco Mining Press*, the Gould and Curry Co. have, during the past ten months, divided \$1,350,000 (£275,000) among its shareholders, besides making an extensive outlay on the mines.

There has been for the past two years a perfect exodus to Nevada Territory from all parts of California. Probably not less than 30,000 people are now residents in that territory who came from California. The discovery of rich mines in Idaho Territory has attracted thousands to

that locality. The Colorado mines, now coming into notoriety, are taking off hundreds, and will, in all probability, carry away thousands another year. Nevada Territory is said to be the richest silver bearing country in the world. It is estimated that the product of this year will be 3,000,000/. At the Idaho mines some fine nuggets have been discovered, the miners are making from \$10 to \$100 per day.

New and rich diggings are claimed to have been discovered in Upper Oregon; the mines are known as "Sinkers Creek" and a party of miners, headed by the discoverers, has started to explore them.

The miners generally at *Walker's* diggings in the Arizon mining district are said to be doing well. Rich leads of gold, silver, copper, and lead are being constantly discovered. There has been great excitement about the mines at Pike's Peak, Santa Fe, and the Rio Grande.

In copper mines there is also great activity, and many new discoveries are being made. The San Francisco *Mining and Scientific Press* states that a large discovery of antimonial sulphuret of copper has been made in *Josephine* county, Oregon. It is found in large masses as an outcrop, covering a ledge 4' thick. It is intended to erect two reverberatory furnaces for the purpose of reducing the ore to regulus, and a smelting furnace will be subsequently added.

The *Noble* Company, in Calaveras county, has lately erected a steam pumping engine on their claim. The *German Hill* Company has struck some fine sulphurets and black oxide at a depth of 30', and the *Star* Company has struck the same quality ore, but in greater quantity.

The reports from Reese River are very favourable; the ledges are small but numerous, and seem to improve in depth. In the Cañon, between Clifton and Austin, there are four five-stamp mills in active work, and two ten-stamp mills are about to be erected.

The *Soledad* copper mines, about 30 miles N.E. from Los Angeles, are situated on the western slope of a range of mountains running N. and S., and promise to become among the most important on the Pacific coast. The veins or leads, which generally bear N. and S., were first discovered about 8 years ago by a Frenchman named Maris, but little was done until about 18 months ago, since which great progress has been made. The ores are mostly the red and black oxides, and grey and yellow sulphides of copper, many containing a notable proportion of the precious metals. The Maris lead, on the property of the Soledad Copper Hill Co., is found to be 7' wide at a depth of 16 fms., made up principally of grey sulphide, rich in gold and silver. The Jesus Maria lead, also, is 4' wide at a depth of 4 fms., made up of similar copper ores highly argentiferous. In the Marguerita lead, which is held in very high estimation, the ores are purple copper: this lead has been explored to the depth of 11 fms. The climate of the district is fine, and wood and water are abundant, sufficient of the latter for mining purposes being obtainable all the year round. Although, as stated, these mines are only 30 miles distant from Los Angeles in a direct line, they are 60 miles distant by the present circuitous route through the San Francisco pass; but a direct road, saving half the cost of carriage, might be made for \$20,000.

Mr. O. T. Meade, a successful miner of California, is said to be worth \$1,000,000, his interest in Union Ledge mine being estimated at \$600,000.

The past season in California has been one of the driest on record, to the great advantage of the mining workings.

The *California Copper Smelting* Works at Antioch are favourably progressing. Coal can be obtained in abundance at moderate rates, and when once in full working order, this establishment will no doubt do a large business.

MEXICO.—Advices have been received by the *Capula Silver Mining* Company, dated October 27th, which state that six men had been placed

to test the ore in the old workings on San José lode, west of La Bomba shaft. These men by day, and two by night, broke out, in one week, 40 bags of ore, which on picking leave 35 clean sq. 9 cargass; of this quantity more one-half is over 30 marks per monton, the remainder not quite half so good. This is by no means a bad result, but nothing can be done in this quarter until the Bomba shaft be put in order, to give complete access to the workings. These workings having been found almost equal to expectation, there is every reason to hope that those on the main vein still further west may be found in a proportionately profitable condition. To accomplish the opening out of these workings, no pains are being spared nor any time lost. The main part of the timber for the whim had been delivered, and the shaft partially secured over to a depth of 20 varas.

The *United Mexican Mining Company* have received despatches, dated Guanajuato, October 20th, advising that the shaft in the mine of Jesus Maria y José is now complete, and has reached a total depth of 372 varas. The ore in the frente of San Juan has much improved, and the frente of Remedios has reached good ore. Other points have varied little. In four weeks the extraction has been 3,961 cargass by the regular miners, and 2,670 by Buscones; the latter sold for 12,196, half to the credit of the mine. The profit on the three months ending 30th ult. has been 11,578.67, of which 2,573 are payable to the owners.

A prospectus has been issued of the *El-Chico Silver Mining and Reduction Company* (Limited), for the purpose of purchasing the San Juan de Mayas mine, in the district of El-Chico, nine miles from Real del Monte, with the adjoining smelting-works. The capital is 75,000*l.*, in 15,000 shares of 5*l.* each.

SOUTH AMERICA.

GRANADA.—The *Mariquita and New Granada Mining Company* have received advices, stating that in Santa Ana Mines, the lode in stope bottom of the 110 is much improved, and promises a large portion of dry stamps ore. The prospects of the mine continue the same as last reported upon.

BRAZIL.—Advices received by the *Santa Barbara Gold Mining Company*, dated November 12th, state that the shaft had been sunk 6' in a lode about 7' wide. The stopes north of the shaft for some time past have been smaller and rather disordered by some crossheads. In the end driving north the lode is larger than usual, better defined, and of a more promising character. In the adit level south all was in readiness to commence driving. Shallow Level is now cleared as far as the end is driven, and the lode in this part so far seen appears wider and of a more promising character. At Trial Level, a branch of ore has been cut about 1' wide, which shows in a sample that has been washed; this is not considered to be the lode, and cross-cutting is going on further west. The system of gold extraction by Ripple tables having been tried, the following is the result:—52 tons of stone have been stamped and cleared over them, which gave 141 oitavas of gold, equal to 2,711 oitavas per ton, the highest produce yet obtained from stone only; the stone stamped has been from the shaft and bottoms. The stone from the shallow level has been mixed with that from the shaft and bottoms; the yield from 452 tons, cleaned up in the usual way, and amalgamated in the barrel (7 barrels) was 1,186 oitavas, equal to 2,623 oitavas per ton. Stamped to date, 531 tons, giving an average yield of gold of 2,754 oitavas per ton, including sand. Amount of gold now on the mine, 1,462 oitavas.

The directors of the *St. John del Rey Mining Company* have received,

by telegram from Lisbon, the following report, October 28:—Produce 10 days of October, second division, 11,366 oitavas; yield 6,414 oitavas per ton. Deficient water supply. Working steadily.

The directors of the *East del Rey Mining Company* have received advices, dated October 28th, stating that Henderson's shaft was being sunk as quickly as possible. The lode, as it gained in depth, was becoming very contracted, but, although small, of good quality. No time was being lost in laying out the works in Emily Mine, so as to bring away the ores from the great lode, and as Spool level No. 2 has been communicated to winze sinking upon it, it was hoped that they would soon be in a position to send ores to the spalling floors from various points of the above lode with facility. The roads were being laid down, the shoots were in hand, and tram waggons were being constructed with all possible speed.

At the last meeting of the Manchester Geological Society, Mr. Plant stated that a coal-field had been recently discovered in the south of Brazil, which in some parts was 65 ft. in thickness. Two smaller ones lie to the north of it, one, said to be very valuable, in the province of Rio Grande do Sul, and the other in San Catharina. The field runs from south to north in one line of deposit, and appears to be oolitic. Until this discovery, coal had never been found in Brazil, and it will no doubt be of great value to the government, as they have hitherto imported at a high price.

ARGENTINE REPUBLIC.—It has been ascertained that extensive silver mines exist in San Juan, at the foot of the Andes, and smelting works have been erected in their vicinity by a company at Buenos Ayres. Coal-fields have also been discovered in the neighbourhood of these mines, and also near Buenos Ayres.

CHILI.—The *Copiapó Mining Company* have received advices from their Agent in Chili, dated October 13. At Checo Copper mine, in the winze sinking below the 65-fm. level east of Price's shaft, the lode is 3 ft. wide, and very promising for metal. The lode in No. 3 winze sinking west, at the 50-fm. level east of Price's shaft, is 3 ft. wide, and looking very promising, and is composed of spar, mundic, and a little ore. The lode in No. 2 winze at the 40-fm. level west of Price's shaft has become wider, with a promising appearance of ore. At Western Sett a winze is being sunk at the 10-fm. level to the east of the new shaft, where the lode is producing some very fine stones for ore. The stopes in the back of the 10-fm. level are producing a good quantity of 15% ore. At Dulcinea Copper Mine the produce is from 2,000 to 3,000 quintals of 20% ore per month. The exports of copper from Chili continue to fall off as shown by the following:—From Atacama district: Exports for September, 1862, 38,841 quintals; ditto, 1863, 19,280 quintals; decrease, 19,561 quintals. From Coquimbo district: Exports for August and September, 1862, 47,225 quintals; ditto, 1863, 16,734 quintals; decrease, 30,491 quintals.

AUSTRALASIA.

VICTORIA.—The directors of the *Port Phillip and Colonial Gold Company* have received the following advices from their resident director at Clunes, giving the results of operations of the month of September last:—Quantity of quartz crushed, 4,708 tons; yield per ton, gold, 9 dwts. 15 grs. Receipts, 3,830*l*. Expenditure:—ordinary, 1,060*l*.; on account of new stamps, 1,080*l*.; total, 2,140*l*. Profit, 1,690*l*.; remittance, 1,450*l*.

The heavy rains have supplied the miners with an abundance of water for washing their gold, and operations have been carried on with great energy. Gold has been discovered by the natives on the Warrego river, near Cooper's Creek, in the crevices of the rocks. Some fine specimens

of it were taken to the settlers, who are flocking to that part of the country. Large quantities of silver are also being dug up at St. Arnaud, which is, in consequence, called "a silver Cornwall." A cake of it was exhibited in Melbourne weighing between 300 oz. and 400 oz., and was the first quantity of the ore that had ever been smelted. Some gold having been found in the bed of the Dargo, about 30 miles from the Omeo diggings, miners are settling there, and several mills have already been constructed for crushing the quartz obtained from the reefs.

SOUTH AUSTRALIA.—From *Great Northern*, Captain Garland reports that at Nuocaluna the whim shaft had been divided and cased down to the 20 fm. level, and a pent-house put in for the supply of the shaftmen while the whim is at work. All works connected with the engine shaft are, he states, now in good order.

The directors of the *English and Australian Copper Company* have received advices dated October 26th. There were three furnaces and one refinery at work at Kooringa; five melting, one roasting, and refinery at the Port works, and it was expected another furnace would be lighted shortly. The stock of coal at the Port was 1,720 tons, at Kapunda 908 tons, and at Kooringa 450 tons, besides about 100 tons of wood. Since the date of the last advices a further shipment of 59 tons of copper had been made. The Company's teams were working well, and everything progressing satisfactorily.

The directors of the *Kapunda Company* have advices to the same date. The quantity of ore raised in August proved on weight and assay to be 365 tons of 18½% average produce, equal to 66½ tons of pure copper, exclusive of 70 tons of sulphur ores for flux; the quantity raised in September was estimated to be 350 tons wet weight, also of good percentage; since the last advices 80 tons copper had been shipped per Coonallo and 21 tons per Murray, both from Adelaide to London.

The reports from *Burra Burra* are satisfactory. At the Karkulto Mine the yield during the half-year had been sufficient to cover the expenditure in connection with that property.

Advices have been received from *Yudanamutana* dated October 26th, stating that at Blinman mine they are not raising so much cartable ore as formerly, of over 30%_o, although there are some thousands of tons in sight from 30%_o down; in breaking out this, very rich deposits are frequently found. As soon as the level between No. 4 and 5 shaft is holed, a good quality of first class ore may be expected from the stopes. The stope in bottom of the 10-fm. level south of No. 1 shaft is not so rich as it has been. The lode is quite as wide, and the bunch of ore extending further north and south, but the quality is not so good, though still an excellent lode. At No. 3 shaft a good quantity of ore was being raised. The Big Bunch is not yielding as much ore as formerly. At *Yudanamutana* the engine-shaft is down about 2 fms. below the 10-fm. level: the lode has very much improved. The lode in the open cutting on the hill is not looking so well. The men have raised some fine ore during the past month. The stope south of Mary's shaft is still holding good. The lode is about a foot and a-half wide, of fine grey ore. At Wheel Gleeson, No. 1 shaft is down 20 fms., and a lode has been cut about a foot wide of iron mundic and black ore. At the Northend level the lode is small, but carrying some good ore; the stopes in this shaft are still looking very well.

From *Worthing* the directors have advices from the Bremer mine to October 26th; 180 tons of ore had been dressed during the month of the usual quality; 48 tons of regulus had been returned, and 2,000 $\frac{1}{2}$ sold. The quantity of ore on hand at the date of the report was 200 tons, and of regulus 38 tons. Expenses for the month, 1,403 $\frac{1}{2}$. The 15" lift had been dropped into place, and the sinking of Legg's engine-shaft to the 63-fm. level continued. The stopes were much as usual, and the appearance of the

mine in every way satisfactory, so much so that the committee were about erecting another reducing furnace.

WESTERN AUSTRALIA.—Advices from *Fortune* dated up to October 23rd state, that the machinery is on the mine, and that when the water is drained to the 40-fm. level, where there is a lode 5' wide, producing 4 tons of ore per fathom, the monthly returns will be increased. The cross-cut north-east of the old working shaft at the 30-fm. level is driven 4 fms., at which point the new engine-shaft which is sunk 10 fms., and is progressing satisfactorily, will be reached. The stope in the back of the 30-fm. level, south-west of shaft, is looking well, producing 3 tons of copper ore per fathom of good quality, and that in the bottom of the 20-fm. level is producing 2 tons of copper and 2 tons of lead ore per fathom. The ores dressed this month are 30 tons of copper and 23 of lead, and 45 tons of copper ore have been sent to the Bay.

NEW SOUTH WALES.—There is nothing of fresh interest to report of this colony. A large extent of ground has been opened up since the rains have drained off, which was before unworkable. It is stated that Mr. Hargraves has been sent from Sydney to prospect for gold in South Australia. His salary is fixed at 1,000*l.* per annum, and he will receive a reward of 5,000*l.* on discovering a payable gold field. He has also been provided with a party of men to accompany him.

Record of the Mining and Metal Markets.

METALLIC-ORE MARKETS.

The standards for black tin remain unaltered up to the close of the month, being quoted at :—

Superior Fine	..	£107	....	Superior Common	..	£104
Second Fine	..	105	....	Second Common	..	103

The *West Briton* remarks that the tin trade has never been more unsettled than at the present time, and the miner appears at a loss to understand how the value of other metals keeps up whilst tin is so depressed.

COPPER.—At the five Cornish sales we give this month, the number of tons, average produce, quantity of fine copper, average price per ton, and standard have been as follows :—

Date.	Tons.	Produce.	Fine Copper. Tons. cwt.	Price per ton.	Standard.
Nov. 26.	.. 3,210	.. 7½ ..	229 15	£5 15 6	£119 2 0
Dec. 3.	.. 3,051	.. 6½ ..	196 11	5 1 6	121 11 0
„ 10.	.. 2,251	.. 7½ ..	160 7	5 13 0	117 18 0
„ 17.	.. 4,955	.. 5½ ..	284 19	4 10 0	126 2 0
„ 24.	.. 2,570	.. 6½ ..	170 13	5 10 0	124 7 0

During the first part of the month the copper standard declined, but at the close improved again. At the sale of Nov. 26th, it declined 16*s.*, at that of Dec. 3rd, 17*s.*, and at that of the 10th, 12*s.*; but at the sale of the 17th there was an advance of 1*l.*, and again on the 24th a further advance of 4*l.*, making altogether a rise of about 2*l.* 15*s.* during the month.

LEAD.—The prices of lead have again generally advanced.

COAL MARKETS.

LONDON, *December 29th.*—From the returns of the Registrar of the London Coal Exchange, of the quantity of sea-borne coal, culm, and cinders, imported into London in the month of November, we learn that the total quantity was 302,734 tons, against 323,889 tons during the corresponding month of last year,—showing a *decrease* of 21,155 tons.

The following are the particulars of the 302,734 tons imported during November :—

Newcastle .. 120,647 tons, in 277 ships	Scotland .. 1,878 tons, in 10 ships
Seaham .. 15,346 " 59 "	Wales .. 5,029 " 14 "
Sunderland . 96,790 " 219 "	Yorkshire .. 1,765 " 24 "
Middlesbro'. 6,783 " 21 "	Small .. 2,593 " 5 "
Hartlepool.. 48,900 " 165 "	Cinders .. 807 " 5 "
Blyth .. 2,216 " 8 "	

The total quantity of sea-borne coal, culm, and cinders imported into London during the eleven months ended November was 2,995,642 tons, against 3,094,348 tons in the corresponding period of last year—showing a *decrease* of 98,706 tons.

The quantity of coal imported by railways and canals during the month of November was 183,015 tons, against 151,819 tons during the corresponding month last year—showing an *increase* of 31,196 tons.

On November 30th, the new ships arrived were 79 ; there was an active inquiry in the market for house-coal, which advanced from 6*d.* to 9*d.* per ton :—Hetton Wallsend, 20*s.* ; Braddyll's Wallsend, 18*s.* 6*d.* ; Lambton Wallsend, 19*s.* 6*d.* ; Eden Main, 17*s.* 6*d.* ; Butes Tanfield Moor, 15*s.* 3*d.* ; Tees Wallsend, 17*s.* 3*d.* ; Steward's Wallsend, 18*s.* 6*d.* ; South Kelloe Wallsend, 17*s.* 6*d.* ; Hasting's Hartley, 16*s.* 6*d.* ; West Hartley, 15*s.* 9*d.* On December 2nd, the 14 arrivals were mostly steamers ; market inactive, and house coal again advanced 6*d.* On the 4th, new ships 4, a further advance of 6*d.* per ton in house coal, and a rise of 3*d.* to 6*d.* in Hartley's. On the 7th, new ships 30, house-coal again advanced 6*d.*, and Hartley's 3*d.* per ton. On the 9th, in consequence of the stormy weather, the arrivals were only 14, mostly steamers, house-coals in great request at another rise of 6*d.* per ton, Hartley's and manufacturers' also in active demand at an advance of from 6*d.* to 9*d.* on last prices. On the 11th, new ships 50. On the 14th, new ships 250, a considerable amount of business was transacted in the market, and house-coal sold freely, at a reduction of from 6*d.* to 9*d.* per ton. On the 16th, new ships 109, market heavy ; house-coal again reduced 6*d.* On the 18th, new ships 80, market good, with a large demand for house-coal. On the 21st, new ships 39, market dull. On the 23rd, new ships 74, market quiet. On the 25th (Christmas day), no market. On the 28th, new ships 92, market quiet. The prices were :—Hetton Wallsend, 20*s.* ; South Hetton Wallsend, 19*s.* 6*d.* ; Haswell Wallsend, 19*s.* Tees Wallsend, 18*s.* ; Braddyll's Wallsend, 18*s.* 6*d.* ; Eden Main, 18*s.* ; Belmont Wallsend, 16*s.* 6*d.* ; Heugh Hall Wallsend, 16*s.* 9*d.*

LIVERPOOL.—From Messrs. J. and T. Platt's Coal Circular for November we find that the quantity of coal, cannel, coke, and patent fuel shipped from Liverpool to foreign and colonial ports during the month of November was 71,440 tons, against 57,230 tons during the corresponding month of last year—showing an *increase* of 14,210 tons. The total shipments from January to November were 543,874 tons, against 580,452 tons in the corresponding period last year—showing a *decrease* of 36,578 tons. The exports coastwise during November were 11,328 tons, against 8,499 tons during the same month last year—showing an *increase* of 2,829 tons. The total exports coastwise from January to November were 97,560 tons,

against 77,705 tons during the corresponding period of last year—showing an increase of 19,855 tons.

CONTRACT FOR COAL.—The Admiralty require the supply of 2,100 tons of South Wales coal, to be delivered at Barbadoes.

SHARE MARKETS.

LONDON, *December 29th*.—During the early part of the month the mining share market was very dull, partly in sympathy with the depression felt on the Stock Exchange. About the middle of the month the fortnightly settlement engrossed most of the attention, but, although operations were in consequence very much restricted, the tone of the market was slightly better. Towards the close business was again interfered with by the Christmas holidays, and transactions were on a very limited scale. Prices have on the whole varied but very slightly, the principal alterations having been a *decline* in Wheal Seton of 2*½*l., in New Rosewarne of 6*½*l., in Stray Park of 5*½*l., and an *advance* of 4*½*l. 10*s*. in East Grylls.

There is no material alteration to report in *West Chiverton* shares, which opened on the 30th at our closing quotations of 53*½*l.-55*½*l. On the 14th they declined to 52*½*l.-54*½*l., at which they remained until the 28th, when they sprang into demand and improved to 53*½*l.-55*½*l., at which price they close. *Herodsfoot* shares opened at 38*½*l.-40*½*l., and rose on the 4th to 40*½*l.-42*½*l.; after fluctuating a little, they close at 39*½*l.-40*½*l. *Chiverton Moor* shares have declined during the month from their opening quotation of 6*½*l.-6*¾*l., and close at 5*¾*l.-5*¾*l., at which price they were in a good demand. *North Chiverton*, 2*½*l.-2*¾*l. *Chiverton*, 9*½*l.-9*¾*l. *East Chiverton*, 5*½*l.-5*¾*l. *Wheal Ludcott and Wrey*, 1*¾*l.-1*¾*l. *Wheal Trelawny*, 21*½*l.-22*½*l. *Wheal Mary Ann*, 12*½*l.-12*¾*l. *Wheal Hope*, 4*¾*l.-5*½*l.

East Caradon shares opened dull at 25*¾*l.-26*¾*l., but improved by the 18th to 28*½*l.-28*¾*l., from which, however, they again relapsed, closing at 27*½*l.-27*¾*l. There has been an improvement in *South Caradon* shares, which opened on the 30th at 41*½*l.-41*¾*l., and close at 42*½*l.-43*½*l. *West Caradon* shares opened on the 30th at 22*½*l.-23*½*l., being a rise of 4*½*l. on last month's closing prices, and on the 1st improved to 22*½*l.-24*½*l. From this date they gradually declined until the 16th, when they were quoted at 18*½*l.-19*½*l. They rallied a little the next few days, and close at 20*½*l.-21*½*l. *Glasgow Caradon Consols*, 3*¾*l.-3*¾*l. *South Caradon Wheal Hooper*, 10*s*.-15*s*. *Caradon Vale*, 3*½*l.-3*¾*l. *Gonamena*, 2*½*l.-2*¾*l. *Marke Valley*, 6*½*l.-6*¾*l.

In *Wheal Seton* there has been a fall of 2*½*l. Shares opened on the 30th at 172*½*l.-175*½*l., and on the 1st improved to 175*½*l.-177*½*l., but after this almost daily declined and close at 147*½*l.-150*½*l. *West Seton* shares opened firm on the 30th at 210*½*l.-220*½*l., but were dull on the 14th at 205*½*l.-215*½*l., and fell again on the 15th to 195*½*l.-205*½*l. They improved on the 19th to 200*½*l.-210*½*l., at which price they close. *North Roskear*, 22*½*l.-24*½*l. *North Crofty*, 5*½*l.-5*¾*l. *Wheal Agar*, 3*½*l.-3*¾*l.

East Grylls shares have improved 4*½*l. 10*s*. upon their last quotations, closing at 13*½*l.-14*½*l. *Great Wheal Fortune* shares have been very dull; they opened at 19*½*l.-20*¾*l., and after but little fluctuation, close at 19*½*l.-20*½*l. *East Lovell* shares have also shown great dullness, opening at 8*½*l.-8*¾*l., and closing at 8*½*l.-8*¾*l., at which price, however, they were reported to be inquired for. *Providence*, 42*½*l.-44*½*l. *East Providence*, 3*¾*l.-4*½*l. *Bassett and Grylls*, 18*½*l.-20*½*l. *Wheal Grylls*, 28*½*l.-29*½*l. *Great Grylls*, 4*½*l.-4*¾*l. *Rosevall Hill and Ransome United*, 3*½*l.-3*¾*l. *Calvadnack*, 6*½*l.-6*¾*l. *Wheal Margery*, 3*½*l.-4*½*l. *Garlidna*, 1*½*l.-1*¾*l. *Wheal Margaret*, 14*½*l.-16*½*l. *West Trevelyan*, 6*s*. 6*d*.-7*s*. 6*d*.

Clifford Amalgamated shares opened on the 30th at our last quotation of 36*½*l.-36*¾*l. By the 12th they had declined to 32*¾*l.-33*¾*l., but on the 14th

were in demand at slightly improved rates; on the 15th, however, they relapsed to 32½l.-33½l. Shares rallied after this, and close at 34l.-34½l. *Nanjiles* shares opened at 29½l.-30½l., and improved on the 4th to 30l.-31l. A decline of 2l. was reported on the 7th, and shares fluctuated almost daily until their closing quotation of 30½l.-30¾l. *St. Day United*, 32s. 6d.-35s. *North Grumbler*, 3½l.-4½l. *Great Wheel Busy*, 3l.-4l. *East Carn Brea*, 6½l.-6¾l. *Wheal Union*, 2½l.-2¾l. *Wheal Uny*, 5½l.-5¾l. *South Carn Brea*, 2½l.-2¾l. *Carn Brea*, 68l.-70l. *South Tolgus*, 36l.-37l. *Great South Tolgus*, 4l.-4½l. *North Downs*, 1½l.-1¾l. *North Treskerby*, 2l.-2½l.

Wheal Basset shares have been very flat. They opened on the 30th at last month's closing prices of 90l.-95l., at which they remained until the 15th, when they stood at 92½l.-97½l. On the 16th they declined to 85l.-90l., on the 18th to 82½l.-90½l., and on the 19th another reduction was made to 82½l.-87½l. Shares improved on the 24th to their closing quotation of 85l.-95l. *East Basset* shares have again declined from 62l.-63l. to 58l.-60l. *Wheal Buller* shares improved at the beginning of the month to 28l.-30l., but have receded again, and close at 22l.-25l. *North Basset*, 2½l.-3l. *South Basset*, 5½l.-6½l. *West Basset*, in demand at 95l.-100l. *West Frances*, 26l.-28l. *South Frances*, 60l.-65l. *Wheal Grenville*, 4½l.-4¾l. *East Grenville*, 2½l.-2¾l. *Copper Hill*, 10l.-12l.

East Russell shares opened on Nov. 30th at 4½l.-5l., and remained with little alteration until the 22nd, when they advanced to 5½l.-5¾l., closing at 5½l.-6l. *New Martha* shares have declined to 1¾l.-2l. *Drakevalls*, 36s.-38s. *Wheal Crebor*, 36s.-38s. *Devon Great Consols*, 544l.-555l. *Kelly Bray*, 16s.-18s. *Hingston Down*, 3l.-3½l., at which price in good demand. *West Maria*, 3½l.-4l. *Furze Hill Wood Consols*, 7s. 6d.-10s. *West Martha*, 15s.-20s. *Wheal Arthur*, 7s. 6d.-10s. *Gawton*, 15s.-17s. 6d. *New Birch Tor and Vitifer*, 2½l.-2¾l.

New Rosewarne shares have steadily declined throughout the month from their opening quotation of 20l.-21l. to 14l.-15l., making altogether a fall of 6l. *Rosewarne United*, 1½l.-2l. *Wheal Unity*, 8s.-10s. *Wheal Kitty* (St. Agnes), in good demand at 7½l.-7¾l. *East Rosewarne*, 2½l.-2¾l. *Pendeen Consols*, 6½l.-7l. *Tolvadden*, 1½l.-1¾l. *Goonbarrow and Molinnis*, 2l.-3l. *East Wheal Ellen*, 3½l.-3¾l.

Stray Park shares have gone back from 33½l.-34½l. to 27l.-29l. *Con-durrow* shares have also receded. They opened at 105l.-115l., and close at 102½l.-105l. *Tincroft*, 18l.-18½l. *Cook's Kitchen*, 20l.-21l. *Wheal Crofty*, 2l.-2½l. *South Crofty*, 19l.-20l. *Camborne Vean*, 2½l.-2¾l.

In Welsh mines prices have been quoted as follows:—*Long Rake*, 4l.-4½l. *Bryn Gwiog*, 33l.-34l. *Prince of Wales*, 5s.-6s. *Bedol-Aur*, 9s.-10s. *North Minera*, 7s.-8s. *Central Minera*, 2l.-2½l. *Rhymney Iron*, 30l.

In Foreign and Colonial mines business has been slack. *St. John Del Rey* shares opened at 59l., but declined to 56l.-57½l. on closing. *Cobre Copper* shares have improved; they were quoted on the 16th at 26½l.-27½l. and went in a few days up to 30l., closing at 29½l., at which they were in demand. *Capula*, 12s. 6d. *Fortuna*, 4l. *Port Phillip*, 1½l.-1¾l. *United Mexican*, 6½l. *Worthing*, 7s. 6d.-10s. *Montes Aures*, 2½l.-2¾l. *Yudanamutana*, 2½l.-2¾l. *Don Pedro North Del Rey*, 17s. 6d. *Scottish Australian*, 10s. *General*, 22l. *Linars*, 6½l. *Kapunda*, 1½l. *Pontgibaud*, 6½l. *Cape Copper*, 6½l. *Vallanascas*, 15s. *Peel River Land and Mining*, 47l. *English and Australian Copper*, 1½l.-2l. *Vancouver Coal*, 5½l. *Anglo-Mexican Mint*, 18l. *Nerbudda Coal and Iron*, 5½l. *New Nerbudda Coal and Iron*, 1¾l.

Among new undertakings, *Otea Copper* shares have been quoted at 1¾l.-2½l. prem. *Crenver and Wheal Abraham*, 10s.-15s. prem. *Mining Company of Italy*, 10s.-12s. 6d. prem. *El-Chico Silver Mining and Reduction*, 15s.-20s.

CORNWALL.—At the beginning of the month a steady business was transacted in the Cornish mining share market, but it afterwards became

rather inactive, owing partly to the high rate of discount, and the drop in the tin and copper standards. At the end of the month, however, the market again showed signs of activity. *St. Day United* shares have been very much dealt in, though at lower prices than our last quotation of 2½*l.* *Wheal Trelawny* shares have been a little better at 20*l.*-21*l.* *Great Wheal Fortune*, more in demand at 20*l.*-21*l.* *Camborne Vean* shares quiet at 2½*l.*-3*l.* *New Rosewarne* shares have been very flat, and were last quoted at 15½*l.* *Wheal Emily Henrietta*, 7½*l.* *Carn Brea*, 69*l.* *Nanjiles*, 30*l.*-30½*l.* *Providence*, 43*l.*-44*l.* *East Lovell*, 8½*l.* *North Crofty*, 5*l.*-5½*l.*

BIRMINGHAM.—*Muntz's Metal* shares have been quoted at 8*s.* 9*d.* dis.

LIVERPOOL.—*Santa Barbara*, 2*s.* 6*d.* dis. *Copiapó and Caldera*, 135*l.*

NEWCASTLE-ON-TYNE.—The mining share market here has been very dull, but quite at the end of the month an active inquiry was made for *Wheal Seton* shares; *West Seton* shares in demand. *Troed-y-rhiw*, 2*s.* 6*d.* prem. *West Chiverton* shares very firm, and those of *Chiverton* and *Chiverton Moor* held for an advance. *Camborne Vean* and *Tincroft* inquired for.

DUBLIN.—The Irish mining share market has maintained great firmness, notwithstanding the advanced rate of discount at the beginning of the month. *General Mining Company of Ireland* shares were very low in the early part of the month, but afterwards improved and were quoted at 4*l.*, though business generally was done at 3½*l.* *Wicklow Copper* shares have experienced an advance, leaving off at 12½*l.*, at which they were in request. *Mining Company of Ireland* shares were much in request at the beginning of the month at 19½*l.*, but experienced a fall about the middle, which they have since quite recovered, and were last quoted at 21*l.* *Cornnorree* shares have been in brisk demand at 1*l.* At the beginning of the month *Carysfoot* shares were steady at 1½*l.*, but buyers have since required a reduction of 2*s.* 6*d.*, and though they are still quoted at 1½*l.*, not much business has lately been done in them.

NEW YORK, December 14th.—The market for mining shares in this city has been quiet during the past month, but prices have been generally maintained. The new concerns quoted are *Montana Gold*, situated in the Colorado territory, and the *Eureka Copper*, in the Lake Superior district. The principal fluctuations have been as follows—ADVANCED: *Cumberland Coal*, 8; *Everett*, 1; *Franklin*, 3; *Hamilton*, ½; *Isle Royal*, 2; *Minesota*, 5; *Ontonagon*, 1½; *Superior*, 2.—DECLINED: *Adventure*, 2; *Bohemian*, 4; *Canada*, ¾; *New York and Nova Scotia Gold*, ¾; *Norwich*, 2; *Pittsburgh*, 5; *Quincy*, 6. The following are the closing prices marked on the Mining Stock Board this day:—*American Coal*, 93-95; *Aztec*, 4½-5; *Adventure*, 7-10; *Bucks Co.*, 1½-1½; *Bohemian*, 12; *Caledonia*, 6½-9½; *Canada*, 2-2½; *Cumberland Coal*, 32-32½; *Carp Lake*, 4½-5½; *Cascade* (Ass't paid), ¾-¾; *Central*, 57½-59; *Columbian*, 8-8½; *Evergreen Bluff*, 8½-9½; *Everett*, 2-4; *Eureka*, 2-2½; *Flint Steel River*, 11; *Franklin*, 49½; *French Creek*, ¾; *Hilton*, 4½-6½; *Hancock*, 13; *Hamilton*, 2½-4; *Huron*, 32-34; *Indiana*, 5½-5½; *Isle Royal*, 25-26; *Knowlton*, 9½-9½; *Lafayette*, 1½-2; *Manhattan*, 3½-4½; *Minesota*, 65; *Montana Gold*, ¾-1; *Norwich*, 6½-7; *New York and Nova Scotia Gold*, 3½-3½; *Ontonagon*, 3-3½; *Ogima*, 4½-5; *Pewabic*, 63-64; *Pittsburgh*, 83-86; *Providence*, 1½-2½; *Placencia Bay*, 1½-2½; *Quartz Hill Gold*, 8-11; *Quicksilver*, 62-64; *Quincy*, 93-96; *Rockland*, 17; *Superior*, 10; *Teal Lake Iron*, 5-6½.

SAN FRANCISCO, November 16th.—Our mining share market during the past month has been quite active, and a large amount of business has been transacted. The recent disposition on the part of the brokers to call in their loans on mining securities, and the heavy assessments (*anglicè* calls) made on unproductive companies, has had the effect of forcing many outside holders to close their holdings in this class of stock, often at a grievous loss. Speculators have consequently been quite sorely pressed of

late, and have been compelled even to part with much of their productive and high priced stocks to enable them to meet calls for assessments. This, together with the present unavailability of mining stocks (with few exceptions) as a basis for negotiating loans, and the sudden realising of a large quantity of hypothecated stocks by banks, has caused a resort to sales, and given rise to a great activity in the face of a very general distrust in this class of security.

The principal operations have been in *Ophir*, *Burning Moscow*, *Gould and Curry*, *Sheba*, *North American*, *Uncle Sam*, *Baltic*, and *Real del Monte*.

Ophir shares opened at \$1,720, but in a fortnight declined to \$1,430, during which period about 2,000 shares changed hands, many large holders realising from uneasiness as to the result of the suit with *Burning Moscow*. About the second week in November shares rallied from \$1,430 to \$1,630 on reported improvements, but again declined to the closing price, \$1,400. *Burning Moscow* has been the principal speculative stock—prices fluctuating from \$255 to \$355, with an immense business doing. *Gould and Curry* shares have also fluctuated, but transactions have not been considerable as the stock is scarce: prices have ranged from \$4,800 to \$4,350. The receipts of this company for last month have been \$400,000 (£80,000), but the expenditure has increased by the prosecution of certain improvements, so that the dividend for the month is not expected to be so good—to be less than \$150. *Sheba* shares, after being very quiet of late, have become suddenly active, advancing from \$70 to \$160, from which however they receded quickly to \$75, but finally recovered to their closing price of \$120. *North American* has sprung into considerable demand, advancing from \$40 to \$70 with about 1,000 shares changing hands. *Uncle Sam* has suddenly come into favour, advancing from \$135 to \$260, declining to \$200, and again recovering to \$275, with stock scarce—and this in the face of an assessment of \$50. A rich strike is reported, with abundance of pay ore in sight. *Baltic*, a claim adjoining *Uncle Sam*, which opened at \$50, rose quickly to \$70, in sympathy, it would appear, to its neighbour. *Real del Monte* opened at \$470, but declined to \$425, the receipts of bullion not being so large, although the general prospects are said to be as good as, if not better than, ever. In the clean-up ending Oct. 31, it was found that 500 tons of ore had afforded an average yield of \$110 (£22) per ton.

Among other shares that have been active may be mentioned:—*Union*, which opened at an advance from \$50 to \$75, but collapsed to \$7½, in consequence of losing its suit with *Yellow Jacket*, which advanced from \$150 to \$1,100, but again fell back to \$950. *De Soto* advanced to \$40, but closes dull at \$30. *El Dorado* and *Wide West* opened dull at \$70 and \$82½ respectively, and declined to \$58 and \$70 respectively. *Utah*, \$62. *Madison* active at an advance from \$30 to \$50, on consolidation with *Burning Moscow*. *Chollar* quiet at \$900. *Overman* declined from \$600 to \$400 in consequence of litigation. *Sierra Nevada*, \$90. *Antelope*, \$175. *Reese River* stocks are attracting attention, but little accurate information being known, operators are timid.

The total number of mines in which transactions are quoted in San Francisco and Virginia city is upwards of 120.

METAL MARKETS.

LONDON, *December 29th*.—The animation which characterised the metal market last month has been firmly maintained during the present, with the exception of the case of tin, in which very little business has been transacted.

IRON.—The activity in the iron trade still continues, and prices seem yet likely to advance.

An extensive business has been done in Scotch pig-iron, which opened at 66s. 9d. cash, 67s. one month. Prices have fluctuated considerably, at one time going up to 68s., and close at 66s. 9d. cash, and 67s. 9d. three months open. The exports have been 16,707 tons, against 20,365 tons in the corresponding period of last year, showing a decrease of 3,658 tons.

Welsh bars have been firm at 7l. 10s. f.o.b., and some makers are asking 7l. 15s. and 8l. There has been an immense demand for Staffordshire descriptions at advanced rates. Swedish iron firm at improved prices.

STEEL has shown no change.

COPPER.—The market both for raw and manufactured has been exceedingly firm, and the smelters have advanced the prices of both sorts 5l. per ton, and it is expected that a further rise will soon be made. Foreign has been scarce, but in good demand. Burra Burra, 106l.; Kapunda, 106l.; Wallaroo, 103l.; Chili, 96l.

YELLOW METAL.—This article has also risen, at a rate of 4d. per lb. from our last quotation.

TIN.—English quiet, and selling from 2l. to 3l. under official prices. In foreign prices have not changed much. Straits have been quoted at 112l. 10s.; Banca, 115l. Dutch market remains unaltered.

TIN PLATES.—This article has been in increased demand at full prices.

LEAD.—The market for this metal has been very firm at 20l. 15s. for soft English pig, and 21l. 15s. for w.b.

SPELTER.—A great improvement has taken place in this article during the past month, and the tendency of the market is still in an upward direction. Hull parcels 19l. 2s. 6d. on the spot, and 19l. 10s. for delivery.

GLASGOW, *December 28th.* IRON.—The pig-iron market exhibited firmness at the close of November, but during the first two or three days of December prices declined. The market then became quiet, and even flat, until towards the middle of the month, when it improved, with a good business doing; becoming very firm towards the end, and closing strong at an advance of 2s. 3d. upon our last quotations. On the 28th prices opened firm at 66s. one month: No. 1, G.M.B., 66s.; No. 3, 65s. On the 30th they became weaker, and declined from 66s. 9d. to 65s. 9d. cash. On the 1st the market opened at 65s. 3d., but declined to 64s. 3d., improving again, however, before the close of the day to 64s. 9d. cash: No. 1, G.M.B., 63s. 9d.; No. 3, 63s. After this the market was quiet with but little doing until the 7th, when another decline took place from 64s. 9d. to 64s. 3d.; closing sellers, 64s. 3d.; buyers, 64s.: No. 1, G.M.B., 63s. 6d.; No. 3, 62s. 6d. On the 8th the market was again weaker, but on the 9th it rallied, and a good business was done at 63s. 9d. to 64s. cash. On the 10th there were signs of increasing firmness, and prices were quoted at 64s. to 64s. 3d. cash; closing sellers, 64s. 3d. From this time until the end of the month the firmness was maintained, and prices steadily improved to their closing quotation of 68s. 6d. cash buyers; sellers, 68s. 7½d.: No. 1, G.M.B., 67s. 6d.; No. 3, 66s. 9d.

PARIS, *December 24th.*—COPPER has been very active, and during the last few days prices have risen. English, 257½ fr.; Chili, 242½ fr. to 245 fr.; Lake Superior, 290 fr.

TIN.—The market for this metal has been quiet, and prices remain unaltered.

LEAD has been equally quiet. French, 53 fr.

SPELTER remains without change.

COLOGNE, *December 27th.*—The holiday time has, as usual, caused the market for all sorts of metals to be very quiet, and the close of the year prevents buyers from making large purchases. Prices of all kinds remain without change.

AMSTERDAM, *December 24th.*—TIN is very quiet and no business doing.
LEAD.—Stolberger, 11½ fl.

BRESLAU, *December 24th.* SPELTER.—There has been great activity in this metal, and several thousand ctrs. have changed hands during the last week at 5¼ thlrs.

HAMBURG, *December 24th.*—There has been a good demand for most sorts of metals, and prices have shown an upward tendency.

LEAD.—English, 14½ to 15¼ mk.

BOMBAY, *December 12th.*—COPPER is less steady, and has declined in value.

IRON has a languid demand, and prices, if anything, are somewhat easier.

LEAD has slightly improved.

STEEL is in limited request.

SPELTER is dull.

TIN PLATES are unchanged in value.

HONGKONG, *November 14th.* LEAD.—Common, \$6.40 to \$6.60; w.b. mark, \$6.80 to \$6.90.

IRON.—Shows but little alteration; sales about 3,900 piculs.

AMOY, *November 6th.* LEAD.—1,021 pigs, at \$7.40.

SHANGHAI, *November 7th.* LEAD.—5.3 taels to 5.4 taels.

IRON.—Nailrod, 1.8 taels to 2.1 taels.

Furnished by Von Dadelszen and North, 158, Leadenhall Street, London, E.C.

During the past month the metal market has been unusually active, and a marked improvement has taken place in every description. The recent stringency in the money market, and the present high rate of discount have exercised but little influence upon the upward tendency of all sorts of metal.

IRON.—Welsh bars have all the month been tending upwards, in the early part of it 7l. f.o.b. Cardiff was asked, with corresponding price f.o.b. here. We now close at 8l. f.o.b. Cardiff, with but little disposition on the part of makers to book any further orders at present. In Staffordshire a further official advance of 20s. took place on the 31st ultimo. Makers very full of orders. In Scotch pigs an enormous business has been done at prices ranging from 63s. 6d. cash to 69s. 6d., and from 65s. three months to 71s.; same terms closing on the 31st at the highest.

COPPER is very firm, although the price was officially raised on the 17th 5l. per ton we quote tough cake, 108l.; sheet, 115l., with but few sellers. Another advance is fully expected.

TIN.—Until within the last few days the market has been very dull, the price of English selling freely at 3l. per ton under official rates, and in foreign as low as 112l. 10s. for cash parcels of straits, the low prices having tempted several buyers; the value has improved to 116l. for cash parcels straits, and 118l. for Banca.

TIN PLATES have been in good demand at full prices.

LEAD.—A good business doing at higher prices.

SPELTER.—We have to report a very large business both for forward and spot parcels, at prices from 18l. 15s. to 20l. 12s. 6d. for spot, and from 19l. to 21l. 7s. 6d. for forward delivery, closing very firm the highest.

QUICKSILVER.—The market is oversold, and this article cannot be bought at all, except for forward delivery, price unaltered, 7l. per bottle.

LONDON PRICES CURRENT OF METALS.

From Messrs. JAMES and SHAKESPEARE'S, 10, Austin Friars, E.C., 24th Dec.

		Per Ton.	
IRON	Bars (Welch) .. in Wales ..	£7 10 0	@ £8 0 0
	" " " " Liverpool	8 0 0	" 8 5 0
	" " " " London	8 5 0	" 8 10 0
	Nail Rods " " " Wales	8 0 0	" 8 10 0
	" (Staffordshire) " Liverpool	9 5 0	" 10 0 0
	" " " " London	9 15 0	" 10 10 0
	Hoops " " Liverpool	10 5 0	" 10 15 0
	" " " " London	10 15 0	" 11 5 0
	Sheets " " Liverpool	11 5 0	" 11 15 0
	" " " " London	11 15 0	" 12 5 0
	Bars " " Liverpool	9 5 0	" 10 0 0
	" " " " London	9 15 0	" 10 10 0
	Scotch Pig (No. 1. g.m.b.) the Clyde	—	" 3 6 6
	Rails	7 5 0	" 7 10 0
	Swedish—Hammered—large sizes	—	" 12 0 0
	" " Indian assortments	12 15 0	" 13 0 0
STEEL	" " Hammered—faggot	17 0 0	" 17 10 0
	" " " in kegs ($\frac{1}{4}$ and $\frac{3}{8}$ in.)	—	" 16 0 0
COPPER	{ Burra and P.C.C.	105 0 0	" 106 0 0
Australian ..	{ Kapunda	106 0 0	" 107 0 0
	{ Wallaroo	105 0 0	" 106 0 0
American....	{ Baltimore	—	" none
	{ Lake Superior	—	" "
	Spanish Cake	—	" 97 0 0
	Chili and other Slab (for 96 per cent. pure Copper)	97 0 0	" 98 0 0
	{ Tough Cake and Ingot and Tile	—	" 103 0 0
English	{ Best selected Ingot	—	" 106 0 0
	{ Sheets, Sheathing and Rod	—	" 110 0 0
	{ Flat Bottoms	—	" 115 0 0
		Per lb.	
YELLOW METAL..	Sheets	9d.	@ 9½d.
	Sheathing and Rod	9½d.	" 9½d.
		Per Cwt.	
TIN	{ Common Blocks and Ingots	110s.	@ 112s.
English ..	{ " Bars (in barrels)	111s.	" 113s.
	{ Refined	116s.	" 117s.
Foreign ..	{ Straits, Fine	113s.	" 113s. 6d.
	{ " (with 3 months' prompt)	115s.	" 116s.
	{ Banca	115s.	" 116s.
		Per Box.	
TIN PLATES	{ Charcoal IC, best	29s. 0d.	@ 30s. 0d.
at Liverpool	{ " IX "	35s. 0d.	" 36s. 0d.
6d. Less	{ Coke IC	24s. 6d.	" 25s. 6d.
	{ " IX	30s. 6d.	" 31s. 6d.
		Per Ton.	
LEAD.....	{ Sheet	—	@ £21 0 0
English ..	{ Pig—W.B.	—	" 21 10 0
	{ " Other good brands	—	" 20 15 0
	{ " German and Spanish, soft ..	—	" 20 0 0
	{ Red	—	" 21 10 0
English ..	{ Shot	—	" 23 0 0
	{ Dry White	—	" 26 0 0
SPELTER	(Silesian) in Cakes	£19 2 6	" 19 5 0
ZINC	(Sheet) No. 9 and upwards	—	" 24 10 0
		Per Bottle.	
QUICKSILVER	(in bottles containing 75lbs. each)	—	@ 7 0 0
		Per Ton.	
REGULUS OF ANTIMONY, French Star		—	@ 38 0 0

Tabular Abstract of Mining Accounts for the Month.

Date of Account.	Name of Mine, and Number of Shares.	Balances.		Calls.		Dividends.	
		Debit.	Credit.	Per Share.	Total.	Per Share.	Total.
		£ s. d.	£ s. d.	£ s. d.	£ s. d.	£ s. d.	£ s. d.
CORNISH & DEVON MINES.							
Nov. 19	Wheal Hope (2,048)	226 16 3	—	0 5 0	512 0 0	—	—
" 21	West Grylls (6,000)	275 7 9	—	0 1 6	450 0 0	—	—
" 23	East Bottle Hill (6,000)	116 11 1	—	—	—	—	—
" 23	Trevenen and Trevenheere (5,600)	1,053 15 2	—	—	—	—	—
" 23	Wheal Emily Henrietta (1,024)	72 7 10	—	0 10 0	512 0 0	—	—
" 24	South Caradon (512)	—	5,230 15 6	—	—	6 0 0	3,072 0 0
" 24	East Basset (512)	—	1,818 1 1	—	—	2 0 0	1,024 0 0
" 24	Gonamena (6,144)	—	51 12 2	0 2 6	768 0 0	—	—
" 24	Great Work Consols (119)	—	407 0 8	—	—	—	—
" 24	South Tolgus (512)	20 0 0	—	—	—	—	—
" 25	Providence (1,120)	—	2,111 5 5	—	—	1 5 0	1,400 0 0
" 25	Wheal Tremayne (2,044)	—	772 15 1	—	—	0 5 0	551 0 0
" 25	Wheal Sidney (4,096)	904 9 4	—	0 5 0	1,024 0 0	—	—
" 25	Wheal Crofty (6,000)	749 12 2	—	—	—	—	—
" 25	Wheal Margaret (896)	178 6 0	—	—	—	—	—
" 25	Wheal Agar (6,000)	211 0 0	—	0 7 0	2,100 0 0	—	—
" 26	Cargoll (916)	—	2,003 0 0	—	—	1 5 0	1,145 0 0
" 26	East Basset & Grylls (1,000)	—	—	0 10 0	500 0 0	—	—
" 26	Clijah and Wentworth (787)	—	—	0 15 0	590 0 0	—	—
" 27	Garden (1,026)	—	140 4 5	—	—	—	—
" 27	Yarner (3,097)	830 8 3	—	0 4 0	619 8 0	—	—
" 30	Illogan (5,000)	97 5 6	—	0 2 6	750 0 0	—	—
" 30	Craddock Moor (1,055)	—	1,015 17 10	—	—	—	—
" 30	Copper Hill (1,024)	—	239 12 4	—	—	—	—
" 30	Tincroft (6,000)	—	3,085 19 5	—	—	0 10 0	3,000 0 0
" 30	Crane (561)	—	—	1 5 0	1,062 10 0	—	—
Dec. 1	West Par Consols (19,000)	1,892 0 0	—	0 2 0	1,900 0 0	—	—
" 1	Ding Dong (672)	648 11 10	—	0 19 0	638 8 0	—	—
" 2	Drakewalls (12,900)	—	976 17 10	—	—	—	—
" 2	Condurrow (256)	5,266 11 2	—	—	—	—	—
" 2	West Sharp Tor (256)	—	209 11 5	3 0 0	768 0 0	—	—
" 2	Trelyon Consols (572)	245 8 6	—	—	—	—	—
" 3	South Seton (400)	573 6 4	—	2 10 0	1,000 0 0	—	—
" 3	South Tresavean (1,024)	1,297 1 4	—	1 5 4	1,297 1 4	—	—
" 4	East Wheal Ellen (1,300)	129 5 7	—	0 5 0	325 0 0	—	—
" 7	North Robert (6,144)	1,636 0 0	—	0 5 0	1,536 0 0	—	—
" 8	Wheal Mary Ann (1,024)	—	1,185 18 4	—	—	—	—
" 8	East Russell (4,000)	—	755 13 4	0 3 0	600 0 0	—	—
" 9	North Pool (6,400)	—	1,970 15 2	—	—	—	—
" 9	Bosweddon (?)	—	—	3 0 0	?	—	—
" 10	Sortridge Consols (12,000)	—	186 12 1	0 2 0	1,200 0 0	—	—
" 10	North Crofty (5,610)	130 13 11	—	—	—	—	—
" 10	East Seton (5,610)	56 1 4	—	0 2 0	561 0 0	—	—
" 11	Boscean (240)	—	13 7 0	—	—	—	—
" 11	Spearne Moor (280)	273 11 1	—	—	—	—	—
" 14	Dolcoath (358)	—	3,165 17 1	—	—	7 0 0	2,506 0 0
" 14	Wheal Seton (396)	—	1,891 0 6	—	—	3 0 0	1,188 0 0
" 14	Durio (1,000)	279 6 5	—	—	—	—	—
" 14	Boscawell (1,248)	—	636 1 7	—	—	0 5 0	312 0 0
" 15	New Rosewarne (1,024)	1,648 13 5	—	1 0 0	1,024 0 0	—	—
" 15	West Seton (100)	—	2,365 0 0	—	—	4 0 0	1,600 0 0
" 15	Wheal Polmear (1,024)	—	370 15 5	—	—	—	—
" 15	New Hendra (400)	50 8 9	—	0 6 0	120 0 0	—	—
" 15	East Carn Brea (6,000)	—	2,047 11 3	—	—	—	—
" 16	Great Wheal Vor (5,908)	—	4,210 0 0	—	—	0 5 0	1,477 0 0
" 16	Caradon Consols (914)	40 9 10	—	0 12 6	571 5 0	—	—
" 16	Great Caradon (4,096)	—	50 15 3	0 2 0	409 12 0	—	—
" 16	Wheal Uny (4,096)	—	803 14 0	—	—	—	—
" 16	North Basset (6,000)	792 0 0	—	0 4 0	1,200 0 0	—	—
" 16	Bedford Consols (4,000)	69 4 3	—	0 1 0	200 0 0	—	—
" 16	Worvas Downs (994)	662 0 0	—	1 0 0	994 0 0	—	—
" 18	Carnyorth (2,048)	776 9 1	—	—	—	—	—
" 18	Great Wheal Busy (6,000)	77 6 4	—	—	—	—	—
" 18	Boscawen 6,000)	1,152 0 0	—	0 5 0	1,500 0 0	—	—
" 22	South Crofty (937)	784 0 0	—	0 15 0	702 15 0	—	—
" 22	Wheal Rose (2,000)	672 3 8	—	0 5 0	500 0 0	—	—
" 22	East Providence (3,986)	165 0 0	—	0 10 0	1,993 0 0	—	—
" 23	Rosewall Hill (6,000)	—	5 0 0	—	—	—	—
" 23	Clifford Amalgamated (2,900)	—	1,550 0 0	—	—	0 10 0	1,450 0 0

For Welsh and Foreign Mines see page 63.

For Welsh and Foreign Mines see page 63.

Copper Ores.

Sampled Nov. 11, and sold at Tabb's Hotel, Redruth, Nov. 26.

Mines.	Tons.	Pur- chasers.	Price.	Mines.	Tons.	Pur- chasers.	Price.
South Caradon	81	1	£9 18 6	North Treakerby	55	7	£5 2 0
	72	6	9 14 6		50	9	3 16 6
	56	6	6 0 6	West Caradon.....	68	1	8 5 6
	54	1, 6	20 11 6		64	7	5 17 0
	53	8	10 11 6		57	7	7 6 0
	50	1	6 8 6		56	6	9 2 0
	46	1, 6	17 10 6		49	2, 9	5 6 6
	36	5	1 14 6		30	13	7 12 6
	30	1	5 19 6		23	9	4 14 0
Great Wheal Busy.....	70	2, 10	2 17 0	Fowey Consols	67	5	5 2 0
	64	2	2 12 6		62	1	7 8 6
	54	2	3 11 6		61	1, 5	0 16 6
	53	12	1 19 6		52	1	5 5 0
	41	3, 6	9 8 6		50	9	4 15 6
	40	8	2 19 0	Wheal Rose.....	82	6	7 8 0
	36	1, 7, 12	1 14 6		81	8	7 8 6
	35	6	2 14 6		60	8	4 13 6
	32	1	1 10 0	North Downs	60	3	6 3 6
	25	8	4 0 6		52	5	6 12 6
	16	6	5 7 6		51	3	5 10 0
	3	1	42 5 6	Craddock Moor	60	8	6 1 6
Clifford Amalgamated	66	9	4 2 0		46	2	7 1 6
	65	10, 12	2 15 6		30	5	7 11 0
	57	1	2 8 6	Wheal Polmear	55	9	6 0 6
	47	10	0 13 6		45	5	8 0 6
	44	12	3 8 0	St. Day United ...	36	5, 7, 10	1 8 6
	40	12	2 17 6		25	2	3 2 0
	32	1, 7	9 1 6		13	3, 5	6 19 0
	30	7	2 17 0	Boscawen.....	35	3	4 12 6
	24	9	6 11 6		25	5	9 14 0
	23	5	3 7 0	Pedn-an-drea	25	10	4 11 0
	22	5	4 8 0	Wheal Leisure	20	5	2 6 6
North Treakerby	70	6	3 19 0	South Crinnis	12	12	2 12 6
	62	7	5 17 6	Perran Mines	11	1	3 6 6
	57	5	5 7 0	Great Onslow Mines ...	2	5	5 5 0
	56	3	4 8 6				

TOTAL PRODUCE AND VALUE.

	Tons.	Amount.		Tons.	Amount.
South Caradon	478	£4,881 16 0	Wheal Polmear	100	£637 10 0
Great Wheal Busy.....	469	1,688 11 6	St. Day United	74	219 3 0
Clifford Amalgamated ...	450	1,593 1 6	Boscawen.....	60	404 7 6
North Treakerby	350	1,665 5 0	Pedn-an-drea	25	113 15 0
West Caradon	345	2,444 0 6	Wheal Leisure	20	46 10 0
Fowey Consols	292	1,364 2 6	South Crinnis	12	31 10 0
Wheal Rose	223	1,488 14 6	Perran Mines	11	36 11 6
North Downs	163	995 10 0	Great Onslow Mines	2	10 10 0
Craddock Moor	136	916 9 0			

EACH COMPANY'S PURCHASE.

	Tons.	Amount.		Tons.	Amount.
1 Vivian and Sons	552½	£4,083 4 3	9 Copper Miners' Co.	292½	£1,373 6 9
2 Freeman and Co.	249½	994 7 3	10 Charles Lambert	151½	352 10 3
3 Grenfell and Sons	229	1,299 1 3	11 Newton, Keates & Co.	—	—
4 Crown Copper Co.	—	—	12 Sweetland, Tuttle & Co. 193½	—	511 13 3
5 Sims, Williams & Co. ...	428	2,201 13 3	13 Penclawdd Copper Co. ...	30	228 15 0
6 Williams, Foster & Co. 457½	—	3,763 10 9			
7 Mason and Elkington ...	308	1,703 15 0	Total	3,210	£18,537 7 6
8 Bankart and Sons	319	2,025 10 6			

verage Produce, 7½.
quantity of Fine Copper, 229 tons 15 cwts.

Average Standard£119 2 0
Average Price per ton 5 15 6

Copper Ores.

Sampled Nov. 18, and sold at Tabb's Hotel, Redruth, Dec. 3.

Mines.	Tons.	Pur- chasers.	Price.	Mines.	Tons.	Pur- chasers.	Price.
Clifford Amalgamated	102	9	£3 19 0	East Pool	29	10	£2 5 6
90	1, 6	9	5 6	Wheal Basset	65	1, 6	4 5 6
85	12	3	19 6	55	1, 6	4 12 6	
80	1, 6	5	9 6	37	1, 6	12 3 6	
77	11	4	19 6	36	1, 6	9 10 6	
67	7	4	12 6	South Tolgus	96	1, 2	3 7 6
50	7	4	8 0	81	1	8 12 6	
45	2, 6, 9	4	12 0	South Frances	61	1	5 1 6
25	1	4	4 6	56	1, 6	8 2 6	
23	5	4	13 0	19	5, 13	3 18 6	
(Consoles)	47	5	8 2 0	South Wheal Crofty	40	10	1 15 0
West Seton	80	7	6 14 6	23	12	1 16 6	
71	3	7	13 6	31	3	6 17 6	
63	9	6	14 6	Tincroft	63	10	2 1 0
62	7	4	14 0	31	2	5 0 0	
55	3	4	17 0	Dolcoath	65	7	5 3 0
52	9, 11	3	17 6	27	9	5 12 6	
50	8	2	12 0	East Basset	49	1, 6	7 2 6
37	3	7	11 6	22	1	8 12 6	
Wheal Seton	30	13	5 10 6	19	1	10 10 6	
(Pendarves)	117	6	5 5 0	Condurrow	51	5	4 8 0
112	9	1	9 6	12	7	6 0 0	
98	2	6	5 6	West Tolgus	49	1, 2, 13	6 4 6
61	1, 6	5	13 6	Wheal Crofty	20	5	1 19 6
15	3	13	7 6	14	5	4 5 6	
East Pool	95	8	3 12 6	33	8	3 13 6	
70	8	0	3 0	Camborne Vean	18	3	3 10 0
59	12	3	8 6	Crane	11	1, 5	6 17 0
39	2, 8	4	12 6	Cook's Kitchen	3	5	9 18 0
35	2	1	12 6	Illogan Mines	3	5	1 11 6
30	10	3	2 0	Mitchell's Ore	1	3	6 3 0

TOTAL PRODUCE AND VALUE.

	Tons.	Amount.		Tons.	Amount.
Clifford Amalgamated.....	691	£3,726 15 0	East Basset	90	£738 17 0
West Seton.....	470	2,676 10 6	Condurrow	63	296 8 0
Wheal Seton	433	2,106 19 0	West Tolgus	48	298 16 0
East Pool	357	953 3 6	Wheal Crofty	34	99 7 0
Wheal Basset.....	193	1,325 12 6	Stray Park	33	121 5 6
South Tolgus	177	1,022 12 6	Camborne Vean	18	63 0 0
South Frances	136	829 3 0	Crane	11	75 7 0
South Wheal Crofty.....	104	343 7 0	Cook's Kitchen	3	29 14 0
Tincroft	94	284 3 0	Illogan Mines	3	4 14 6
Dolcoath.....	92	486 12 6	Mitchell's Ore	1	6 3 0

EACH COMPANY'S PURCHASE.

	Tons.	Amount.		Tons.	Amount.
1 Vivian and Sons	542	£3,673 16 7	9 Copper Miners' Co.....	345	£1,313 8 0
2 Freeman and Co.....	262½	1,244 5 7	10 Charles Lambert	162	358 2 6
3 Grenfell and Sons	228	1,574 17 0	11 Newton, Keates & Co. ...	103	483 16 6
4 Crown Copper Co.	—	—	12 Sweetland, Tuttle & Co. ...	177	600 3 6
5 Sims, Williams & Co.	176	920 15 9	13 Penclawdd Copper Co. ...	55½	299 6 1
6 Williams, Foster & Co.	396½	2,567 11 9			
7 Mason and Elkington	336	1,766 0 6	Total	3,051	£15,498 10 6
8 Bankart and Sons	267½	696 6 9			

Average Produce, 6½.
Quality of Fine Copper, 196 tons 11 cwt.Average Standard£121 11 0
Average Price per ton 5 1 6

Copper Ores.

Sampled Nov. 25, and sold at Tabb's Hotel, Redruth, Dec. 10.

Mines.	Tons.	Pur- chasers.	Price.	Mines.	Tons.	Pur- chasers.	Price.
West Basset	86	9	£3 8 6	Copper Hill	33	12	£1 6 0
	76	9	6 5 6	Great South Tolgus...	55	4, 6	9 1 0
	61	7	6 18 0		48	3	6 15 0
	57	7	4 7 0	Wheal Uny	49	2	5 19 6
	56	13	5 9 6		44	3, 7, 11	4 16 6
	52	5	12 2 6	Rosewarne Consols ...	40	2, 6	7 19 0
	39	11	6 18 6		39	2	6 1 0
Carn Brea	27	5	3 13 6		12	8	4 17 0
	68	3	7 7 6	Charlotte United	43	6	7 7 6
	64	5	8 6 6		40	9, 11	4 15 6
	49	5	2 15 6		7	1	1 1 6
	46	10	3 2 0	Pendeen Consols	62	8	2 19 0
	42	7	3 17 0		26	5, 8	3 9 0
Prosper United.....	67	12	4 4 6	Rosewarne United ...	38	3, 7	9 15 6
	64	1	2 6 6		35	5	3 3 6
	61	6	3 6 6	New Rosewarne	51	4, 6, 7	8 8 0
	26	8	6 14 6		20	13	20 2 6
Par Consols	58	8	5 18 0	Wheal Buller.....	60	3, 10	2 9 0
	57	1, 6	6 15 6		5	5	11 17 6
	40	10	3 15 0		2	1	43 0 0
	3	5	49 18 0		1	1	48 0 0
East Carn Brea.....	79	3, 4, 6	4 4 6	Wheal Anna	47	6	5 14 6
	40	4, 6, 11	4 1 6		10	1	4 4 0
	17	13	4 16 6	Old Wheal Neptune...	30	5	13 10 0
Treloweth	47	1	3 2 6	South Dolcoath	18	3	3 10 6
	25	5	2 3 0	Camborne Consols ...	8	3	8 2 6
	24	8, 11	4 13 0	Pembroke	2	12	1 19 6
	17	5, 6	12 4 6	Great Crinnis	2	1	36 5 6
Copper Hill	38	5	1 8 0	West Par Consols.....	2	1	8 9 6
	36	1	7 5 6				

TOTAL PRODUCE AND VALUE.

	Tons.	Amount.		Tons.	Amount.
West Basset	454	£2,746 14 0	Pendeen Consols	88	£272 12 0
Carn Brea	269	1,474 11 6	Rosewarne United	73	482 11 6
Prosper United.....	218	809 11 0	New Rosewarne	71	430 18 0
Par Consols	158	1,028 1 6	Wheal Buller	68	340 7 6
East Carn Brea.....	136	578 16 0	Wheal Anna	57	311 1 6
Treloweth	113	520 1 0	Old Wheal Neptune	30	105 0 0
Copper Hill	107	358 0 0	South Dolcoath	18	243 9 0
Great South Tolgus ..	103	821 15 0	Camborne Consols	8	65 0 0
Wheal Uny.....	93	505 1 6	Pembroke	2	3 19 0
Rosewarne Consols	91	612 3 0	Great Crinnis	2	72 11 0
Charlotte United	90	515 13 0	West Par Consols.....	2	16 19 0

EACH COMPANY'S PURCHASE.

	Tons.	Amount.		Tons.	Amount.
1 Vivian and Sons	199½	£1,023 13 9	9 Copper Miners' Co. ...	182	£866 19 0
2 Freeman and Co.	108	687 14 6	10 Charles Lambert.....	116	366 2 0
3 Grenfell and Sons	232	1,575 4 0	11 Newton, Keates & Co. ..	99	546 9 6
4 Crown Copper Co.	—	—	12 Sweetland, Tuttle & Co. ..	102	329 18 6
5 Sims, Williams & Co. ...	349½	2,079 8 3	13 Penclawdd Copper Co. ..	93	791 2 6
6 Williams, Foster & Co. ...	376½	2,359 11 2			
7 Mason and Elkington ...	210½	1,229 16 10	Total	2,251	£12,714 16 0
8 Bankart and Sons	183	858 16 0			

Average Produce, 7½.
Quantity of Fine Copper, 160 tons 7 cwts.Average Standard £117 18 0
Average Price per ton 5 13 0

Foreign Lead Ore Sale.

Date.	Mine.	Tons.	Price per ton.	Purchasers.	Amount of Money.
			£ s. d.		£ s. d.
Nov 23.	Talisker (Australia).....	50	18 15 0	B. Mitchell & Son	937 10 0

Copper Ores.

Sampled Dec. 2, and sold at the Royal Hotel, Truro, Dec. 17.

Mines.	Tons.	Pur- chasers.	Price.	Mines.	Tons.	Pur- chasers.	Price.
Devon Great Consols	135	5	£5 1 6	Phoenix Mines	69	8	£3 18 8
	135	6	5 8 6		60	3	5 0 0
	131	8	4 13 0	Marke Valley	85	9	3 3 0
	130	5	4 10 6		84	9	3 2 0
	127	12	1 5 6		83	5	2 17 6
	126	1	4 15 0		63	8	2 18 0
	123	1	4 19 6		66	5	2 8 0
	118	6	4 7 6		82	3	6 2 6
	115	6	5 13 6	Devon and Cornwall	100	8	1 19 0
	114	2	5 6 6		83	7	2 3 0
	113	13	5 11 6		83	5, 9	1 16 0
	111	11, 13	5 6 0		84	11	10 10 6
	106	5, 6, 9	4 4 6		80	7, 11, 12	2 14 6
	105	13	4 10 0	Bedford United.....	105	13	4 17 6
	98	2	5 10 6		95	12	3 6 6
	90	1	3 4 6	Wheal Crelake	75	9	2 9 6
	87	1	3 17 6		60	11	3 14 0
	85	10	1 3 0	Brookwood.....	46	2	7 14 0
	58	1	13 6 0		44	8	3 13 6
	51	10	2 1 6		40	12	4 0 6
	45	10	2 3 0	Wheal Emma	64	1, 5	1 11 0
	42	1	2 5 6		35	8	5 14 6
	29	1	10 14 6		26	8	2 18 6
	18	1	2 6 6	Wheal Friendship ...	58	7	10 4 0
East Caradon	90	4, 6	5 2 6		49	7	8 6 0
	86	4, 6	4 8 0	West Wheal Martha...	74	1, 5	1 12 0
	80	8	4 14 0		30	1, 5	1 12 0
	77	6	5 11 0	North Wheal Robert	50	9	5 4 0
	64	1	9 2 6		12	9	1 19 0
	58	5	9 1 6	Wheal Arthur	35	4, 6	5 5 6
	50	1	15 5 6		15	4, 6, 9	0 13 6
Phoenix Mines	91	6	4 4 6	Foock Works Regulus	38	1, 5	7 19 0
	90	8	3 1 6	Sortridge Consols.....	36	9	6 17 0
	76	5	2 4 6	Fursdon.....	22	12	3 15 6
	74	5	1 4 0				

TOTAL PRODUCE AND VALUE.

	Tons.	Amount.		Tons.	Amount.
Devon Great Consols...	2,290	£10,581 7 6	Wheal Emma	115	£360 2 6
East Caradon	503	3,498 19 0	Wheal Friendship	107	998 6 0
Phoenix Mines.....	460	1,489 19 0	West Wheal Martha	104	166 8 0
Marke Valley	403	1,279 17 6	North Wheal Robert	62	283 8 0
Devon and Cornwall ...	300	908 9 0	Wheal Arthur	50	194 15 0
Bedford United	200	827 15 0	Foock Works Regulus ...	38	302 2 0
Wheal Crelake	135	407 12 6	Sortridge Consols	36	246 12 0
Brookwood	130	676 18 0	Fursdon.....	22	83 1 0

EACH COMPANY'S PURCHASE.

	Tons.	Amount.		Tons.	Amount.
1 Vivian and Sons	785	£4,682 18 6	9 Copper Miners' Co.	408½	£1,444 2 8
2 Freeman and Co.	258	1,502 14 0	10 Charles Lambert	181	300 6 6
3 Grenfell and Sons	92	496 0 0	11 Newton, Keates & Co....	159½	901 5 0
4 Crown Copper Co.....	—	—	12 Sweetland, Tuttle & Co.294	—	749 2 0
5 Sims, Williams & Co. ...	695½	2,796 15 8	13 Penclawdd Copper Co.378½	—	1,908 10 0
6 Williams, Foster & Co. ...	86½	3,971 6 8			
7 Mason and Elkington ...	200	1,204 0 0	Total	4,965	£22,305 12 0
8 Bankart and Sons	638	2,348 11 0			

Average Produce, 5½.
Quantity of Fine Copper, 284 tons 19 cwt.

Average Standard

Average Price per ton

Copper Ores.

Sampled Dec. 9, and sold at Tabb's Hotel, Truro, Dec. 24.

Mines.	Tons.	Pur- chasers.	Price.	Mines.	Tons.	Pur- chasers.	Price.
South Caradon	78	11	£6 13 6	Tywarnhale	71	4, 6	£3 12 6
	77	7	6 12 6		70	4, 6	2 12 6
	75	7	9 16 0		51	3, 12	3 6 6
	74	7, 11	10 4 0		45	3	2 16 6
	53	3	19 5 6		44	4, 6	7 14 6
	47	1, 5	19 12 0		40	1	2 4 6
	30	9	6 6 0		29	3	8 7 6
	22	9	9 15 0	Craddock Moor.....	61	3, 6	8 8 0
Great Wheal Busy ...	91	8	3 19 6		50	6	6 2 6
	90	2	2 19 6		41	9	6 10 0
	68	6, 8	2 16 0		32	1	0 15 0
	51	1	3 3 6		22	1, 12	3 10 6
	50	5	2 15 6	Great North Downs...	55	12	4 16 6
(Old Hallenbeagle)	34	8	3 17 6		40	2	6 7 6
	27	3	7 13 0	Boscawen	47	12	4 16 6
Clifford Amalgamated	60	12	3 6 6		27	13	9 10 6
	58	10	0 12 0	Great Brigan....	45	4, 6, 7	5 18 0
	57	11	5 16 0		28	7	4 4 6
	55	9	3 15 6	Nangiles	37	3	6 4 6
	52	1	3 12 6		35	3	5 17 6
	35	5	2 11 0	Wheal Towan	20	5	1 17 6
	20	2	3 15 6		10	5	0 4 6
	18	3	8 0 0		1	1	5 0 0
	18	3	4 11 0	Falmouth & Sperries	30	1, 5	3 18 6
West Damsel.....	76	7	3 19 6		22	4, 6	5 16 6
	67	10, 11	4 7 6	North Grambler	14	4, 6	5 11 6
	63	7	4 12 6	Grambler & St. Aubyn	4	8	7 11 0
	61	7	4 12 6	Phillips's Ore.....	4	5	2 9 6
	57	10	4 7 6	Oliver's Ore.....	4	5	35 9 0
	26	7	3 3 6	Trevethan's Ore	4	5	

TOTAL PRODUCE AND VALUE.

	Tons.	Amount.		Tons.	Amount.
South Caradon	456	£4,866 17 0	Nangiles	72	£435 19 0
Great Wheal Busy	411	1,455 9 0	Wheal Towan	31	44 15 0
Clifford Amalgamated ...	374	1,359 13 6	Falmouth & Sperries...	30	117 15 0
West Damsel	350	1,500 13 0	North Grambler.....	22	128 3 0
Tywarnhale	350	1,409 12 0	Grambler and St. Aubyn	14	78 1 0
Craddock Moor	206	1,186 14 0	Phillips's Ore	44	30 4 0
Great North Downs	95	520 7 6	Oliver's Ore.....	4	9 18 0
Boscawen	74	483 19 0	Trevethan's Ore.....	4	141 16 0
Great Brigan	73	883 2 0			

EACH COMPANY'S PURCHASE.

	Tons.	Amount.		Tons.	Amount.
1 Vivian and Sons	225½	£1,026 13 6	9 Copper Miners' Co.	148	£877 12 6
2 Freeman and Co.....	155	598 5 0	10 Charles Lambert	149½	430 14 9
3 Grenfell and Sons	301	2,527 1 3	11 Newton, Keates & Co....	205½	1,375 4 3
4 Crown Copper Co.	—	—	12 Sweetland, Tuttle & Co. 198½		815 4 3
5 Sims, Willyams & Co....	161½	938 18 6	13 Penclawdd Copper Co....	27	257 3 6
6 Williams, Foster & Co. 365½		1,820 3 0			
7 Mason and Elkington... 458		2,786 15 6	Total.....	2,570	£14,162 18 0
8 Bankart and Sons	181	699 1 6			

Average Produce, 6½.
Quantity of Fine Copper, 170 tons 13 cwt.

Average Standard £124 7 0
Average Price per ton 5 10 0

Sundry Copper Ore Sales.

Date.	Mine.	Tons. c.	Price per ton.	Purchasers.	Amount of Money.
Dec. 1.	Okel Tor	98 3	£ 3 19 0	—	£ 387 13 3
	„	28 4	0 16 6	—	28 5 1

Copper Ores.

Sampled Nov. 18, and sold at Swansea Dec. 8.

Mines.	Tons.	Pro-duce.	Pur-chasers.	Price.	Mines.	Tons.	Pro-duce.	Pur-chasers.	Price.
Berehaven.....	115	9½	1, 7	£8 3 6	Cuba	48	21½	9	£18 4 6
	71	9½	9	7 17 6		10	68½	5	56 2 6
	96	9½	10	8 0 6		8	66½	5	55 1 6
	21	9½	10	8 1 6	Precipitate	10	71½	10	60 17 6
	100	9½	10	8 10 6	Laxey.....	109	5½	6, 7	4 17 0
	58	10	7	8 10 6	Soller	46	4½	11, 14	3 8 0
Knockmahon ...	138	12½	1, 7	10 14 6		46	2½	11	1 12 0
	135	10½	6	8 19 0		3	1½	5	0 7 6
	82	10½	6	8 13 0	Connorree Ore...	41	3½	6	2 9 0
	42	10	1, 7	8 11 0		36	3½	6	2 9 0
Cuba	105	13½	7	11 14 6	Burnt Ore	90	3½	2	2 11 0
	100	14	2	11 14 0	Welcome Mine...	4	40½	10	35 7 6
	11	67½	6	56 2 0	African Ore	2	15½	3	13 4 0
	90	13½	3	11 11 0					

TOTAL PRODUCE AND VALUE.

	Tons.	Amount.		Tons.	Amount.
Berehaven	461	£3,786 3 6	Soller	95	£231 1 6
Knockmahon	395	3,735 5 0	Connorree Ore	77	188 13 0
Cuba	372	5,944 7 6	Burnt Ore	90	229 10 0
Precipitate.....	10	608 15 0	Welcome Mine.....	4	141 10 0
Laxey.....	109	528 13 0	African Ore	2	26 8 0

EACH COMPANY'S PURCHASE.

	Tons.	Amount.		Tons.	Amount.
1 Copper Miners' Co.	146½	£1,378 18 3	10 Bankart and Sons	231	£2,542 14 6
2 Freeman and Co.	190	1,399 10 0	11 Charles Lambert	69	151 16 0
3 Grenfell and Sons	92	1,065 18 0	12 Ravenhead Copper Co.	—	—
4 Crown Copper Co.	—	—	13 Sweetland, Tuttle & Co.	—	—
5 Sims, Williams, & Co.	21	1,012 18 6	14 Jennings & Co.	23	78 4 0
6 Vivians and Sons	359½	2,987 12 6	15 Penclawdd Copper Co. ...	—	—
7 Williams, Foster & Co.	364	3,368 16 3			
8 British and For. Copper Co. —	—	—	Total	1,615	£15,420 6 6
9 Mason and Elkington	119	1,443 18 6			

Black Tin Sales.

Dates.	Mines.	Tons c. q. lbs.	Price per ton.	Purchasers.	Money.
			£ s. d.		£ s. d.
Oct.	West Wheal Jane	7 6 1 2	62 10 0	Trethellan Co.	850 12 11
Nov. 17.	Retanna Hill	0 18 1 21	62 10 0	Bolithe & Sons	57 12 0
" 21.	Kitty (St. Agnes)	19 15 3 5	—	—	1281 7 4
"	Wheal Harriett	—	—	—	532 10 6
"	Penhalls	3 4 1 10	—	—	205 17 8
" 27.	Gurlyn	4 14 3 9	65 15 0	Mellanear	311 15 0
"	Retanna Hill	0 3 0 5	66 0 0	Bolithe & Sons	8 10 6
"	Leeds & St. Aubyn	5 4 2 25	65 0 0	Chyandour.....	340 7 0
" 28.	South Carn Brea	8 8 1 15	61 15 0	—	519 17 8
"	Cornubia	4 5 3 5	66 0 0	—	283 2 5
Dec. 2.	Great Wheal Busy	16 13 2 18	—	—	972 7 4
" 3.	Prosper United	14 19 1 12	—	Bolithe & Sons	952 3 6
" 5.	Great Wheal Vor	34 3 1 1	—	—	2345 9 4
"	North Wheal Jane.....	1 18 1 14	—	Daubuz & Co.	113 13 9
" 10.	Wheal Sidney	4 1 0 16	64 10 0	ditto	261 13 9
" 11.	Great Work.....	10 12 3 21	71 5 0	Truro Co.	768 11 8
" 12.	Cuddra	6 5 1 14	65 7 6	—	422 15 8
"	"	0 6 1 26	40 0 0	—	2527 6 2
"	West Fowey Consols	39 5 0 21	64 7 6	—	135 0 0
"	West Wheal Kitty	2 5 0 0	60 0 0	Truro Co.	728 17 2
"	New Birch Tor	11 9 1 16	—	Harvey & Co.	1302 18 2
" 19.	Kitty (St. Agnes)	20 2 1 22	—	—	178 16 6
"	Penhalls	2 15 3 15	—	—	134 14 0
"	Wheal Par	1 19 1 25	68 5 0	Redruth Co.	2418 16 5
"	St. Day United	32 0 1 4	—	Harvey & Co.	47 13 6
"	"	10 0 1 5	—	Michell & Co.	—
"	St. Just Consols	0 14 1 16	—	—	—

Copper Ores.

Sampled Dec. 2, and sold at Swansea, Dec. 22.

Mines.	Tons.	Pro-duce.	Pur-chasers.	Price.	Mines.	Tons.	Pro-duce.	Pur-chasers.	Price.
Cobre	106	11 1/2	11	£10 14 6	Norway	16	2 1/2	7	£1 19 0
	73	11 1/2	11	10 14 6	Cape Copper	38	32 1/2	5	30 10 6
(Regulus) 43	48 1/2	11		44 17 0	(Ookip) 64	32 1/2	10	30 10 6	
	105	12 1/2	11	10 16 6		37	28 1/2	10, 15	25 3 6
	74	12 1/2	11	10 14 6	(Spectakel) 65	32	10, 15	30	7 6
(Regulus) 42	48 1/2	3		44 0 0		34	48	6	46 11 0
	85	11 1/2	3, 11, 14	10 16 6		46	35 1/2	7	33 19 0
	81	12 1/2	3	10 12 6		30	36 1/2	14	34 2 6
(Precipitate) 17	51 1/2	3		45 16 0	(Sweepings) 5	34 1/2	5	32 1 0	
Norway	95	2 1/2	7	1 7 6	Cuba	107	13 1/2	1, 7, 9	11 17 6
	93	2 1/2	7	1 7 6		100	13 1/2	2	12 0 0
	87	2 1/2	7	1 10 0	Knockmahon.....	147	12 1/2	2, 7	11 11 6
	88	2 1/2	7	1 9 6		57	11 1/2	14	10 17 0
	84	2 1/2	7	1 7 6	(Sweepings) 2	7 1/2	10	6	15 6
	83	2 1/2	7	1 12 6	Burnt Ore	98	3	7, 14	2 5 0
	34	10 1/2	7	9 9 0	Precipitate.....	1	62 1/2	5	57 7 6
	23	3	7	2 4 0					

TOTAL PRODUCE AND VALUE.

	Tons.	Amount.		Tons.	Amount.
Cobre	628	£10,185 19 0	Knockmahon	206	£2,333 10 6
Norway	603	1,172 5 6	Burnt Ore	98	220 10 0
Cape Copper	319	10,347 16 0	Precipitate	1	57 7 6
Cuba	207	2,470 12 6			

EACH COMPANY'S PURCHASE.

	Tons.	Amount.		Tons.	Amount.
1 Copper Miners' Co.	35 1/2	£423 10 10	9 Mason and Elkington ...	35 1/2	£423 10 10
2 Freeman and Co.	173 1/2	2,050 15 3	10 Bankart and Sons	117	3,420 1 6
3 Grenfell and Sons	168 1/2	3,798 15 8	11 Charles Lambert	429 1/2	6,085 6 2
4 Crown Copper Co.	—	—	12 Ravenhead Copper Co. ...	—	—
5 Sims, Williams, Nevill & Co.	44	1,377 11 0	13 Sweetland, Tuttle & Co. ...	—	—
6 Vivian and Sons	34	1,582 14 6	14 Jennings & Co.	164 1/2	2,059 3 2
7 Williams, Foster & Co.	807 1/2	4,118 10 7	15 Penclawdd Copper Co. ...	51	1,452 18 6
8 British and For. Copper Co. —	—	—	Total	2,060	£28,788 1 0

No Sale on Jan. 12th.

Tabular Abstract of Mining Accounts—(continued from p. 56).

Date of Account.	Name of Mine, and Number of Shares.	Balances.		Calls.		Dividends.	
		Debit.	Credit.	Per Share.	Total.	Per Share.	Total.
		£ s. d.	£ s. d.	£ s. d.	£ s. d.	£ s. d.	£ s. d.
	WELSH & OTHER MINES.						
Nov. 6	Minera (1,800)	—	—	—	—	6 5 0	11,200 0 0
" 30	South Darren (6,000)	273 5 9	—	—	—	—	—
Dec. 10	Coolartra and Bond (16,000)	—	1,082 15 2	0 10 0	3,000 0 0	—	—
" 17	Aberdovey (700)	193 7 5	—	—	—	—	—
" 22	Cambrian Consolidated (75,000)	—	17,119 0 0	—	—	—	—
" 23	Garreg (1,000)	235 11 6	—	0 3 0	150 0 0	—	—
" 23	Merilyn (4,480)	324 16 11	—	0 1 6	336 0 0	—	—
	FOREIGN MINES.						
Nov. 27	Alten & Quenangen (10,000)	—	3,723 11 7	—	—	—	—
" 30	Santa Barbara (60,000)	—	—	0 2 6	7,500 0 0	—	—
Dec. 16	Vallanzasca (50,000)	—	4,500 15 5	0 2 6	6,250 0 0	—	—
" 18	St. John Del Rey (11,000) ...	—	—	—	—	3 0 0	33,000 0 0

Lead Ore Sales.

Dates.	Mines.	Tons.	Price per Ton.			Purchasers.	Amount of Money.	
			£	s.	d.		£ s. d.	
Nov. 26.	Pant-y-Mwyn	13	12	8	0	Walker, Parker & Co.	161 4 0	
	North Henblas	12	12	9	0	ditto	149 8 0	
	Llanerchyratur	26	13	17	6	Newton, Keates & Co.	360 15 0	
	Cwmbyr	27½	12	13	6	A. Eyton	348 11 3	
	Roman Gravels	20	13	11	6	ditto	271 10 0	
	Park	6	13	0	0	Newton, Keates & Co.	156 0 0	
	"	6	13	0	0	Walker, Parker & Co.	156 0 0	
	Bwch-y-Plum	25½	13	12	6	ditto	347 8 9	
" 27.	Newtownards	63	13	12	0	Sims, Williams & Co.	856 16 0	
" 30.	East Logylas	50	13	11	6	Panther Co.	678 15 0	
	Glogfach	60	17	0	0	Stock & Co.	1020 0 0	
	Cwmystwith	60	13	6	0	Sims, Williams & Co.	1597 10 0	
	"	60	13	6	0	Panther Co.	1597 10 0	
	Goginan	10	16	17	6	ditto	487 8 6	
	"	21	18	3	6	R. Michell & Son	1688 15 0	
Dec. 2.	Wheal Mary Ann	50	25	4	0	Stock & Co.	247 10 0	
	"	30	14	4	6	R. Michell & Son	247 10 0	
	Miners Union	18	13	15	0	Brymbo Co.	247 10 0	
" 4.	Miners	100	14	3	6	Walker, Parker & Co.	6194 9 6	
"	"	100	14	3	6	ditto		
"	"	76	14	3	6	ditto		
"	"	50	14	3	6	ditto		
"	"	61	14	3	6	ditto		
	"	50	14	3	6	A. Eyton	1954 5 0	
" 8.	Isle of Man Mining Co.	100	15	5	6	Walker, Parker & Co.		
	"	30	14	4	6	Stock & Co.		
" 10.	Talargoch (Maesyrerwddu) ..	31½	14	11	0	Newton, Keates & Co.		458 6 6
	" (Coetia Llys) ..	76	15	9	6	Walker, Parker & Co.		1176 2 0
	Deep Level	15	13	12	0	Newton, Keates & Co.	204 0 0	
	Parry's	12½	13	19	6	A. Eyton	174 13 9	
	Bryn Gwlog	25	14	8	6	Newton, Keates & Co.	721 5 0	
	"	25	14	8	6	Walker, Parker & Co.	120 7 6	
	Speedwell	9	13	7	6	ditto	73 10 0	
	Chware Las	5	14	14	0	ditto	119 14 6	
	Summer Hill	7	14	3	6	A. Eyton	119 14 6	
	"	2	10	5	0	Walker, Parker & Co.	282 3 6	
	Pennant	10	13	17	6	ditto	282 3 6	
	"	5	13	18	0	Newton, Keates & Co.	282 3 6	
	"	5	13	18	0	A. Eyton	282 3 6	
	"	1	14	8	6	ditto	311 19 3	
	Clwt Militia	23½	13	5	6	Walker, Parker & Co.	441 0 0	
	Pool Park	30	14	14	0	ditto	522 9 0	
	Llangynog United	17	13	10	6	Newton, Keates & Co.	249 18 6	
	Dyllife	38	14	5	6	A. Eyton	542 9 0	
	Caeconroy	13	14	3	0	Newton, Keates & Co.	183 19 0	
	Ludcott & Wrey Consols	50	17	10	6	J. and J. Williams	876 5 0	
" 14.	Frongoch	83	13	10	6	Panther Co.	2253 9 0	
	"	83	13	12	6	ditto	1261 17 6	
	East Darren	76	16	16	6	ditto	989 10 0	
	Cwm Erfin	35	17	1	6	ditto	288 15 0	
	"	25	16	17	6	R. Michell & Son	353 12 0	
" 15.	Cefn Brwyno	21	13	15	0	Sims, Williams & Co.	267 10 0	
" 16.	Dyffrynwm	26	13	12	0	Newton, Keates & Co.	267 10 0	
" 16.	Harwood	20	12	17	6	Locke, Blackett & Co.	545 3 1½	
" 17.	East Jane	22½	16	2	6	—	545 3 1½	
	"	15	12	8	6	—		
" 19.	Isle of Man Mining Co.	100	22	1	0	J. & J. Williams	2205 0 0	
" 22.	Frank Mills	85	12	2	6	Stock & Co.	1030 12 6	
" 24.	Westminster	36	14	4	0	Brymbo Co.	511 4 0	
	Maesysafn	80	14	0	0	ditto	1120 0 0	
	Hendre Ucha	9	14	8	6	Walker, Parker & Co.	129 16 6	
	Bryngwyn	15	14	11	0	Newton, Keates & Co.	291 17 6	
	"	5	14	14	6	Walker, Parker & Co.	256 10 0	
	North Henblas	20	12	16	6	ditto	308 11 0	
	Roman Gravels	22	14	0	6	Newton, Keates & Co.	300 16 6	
	Llanerchyratur	10½	14	6	6	ditto	240 2 6	
	"	10½	14	6	6	Walker, Parker & Co.	240 2 6	
	Dyffrynwm	17	14	2	6	Brymbo Co.	240 2 6	



THE

MINING AND SMELTING MAGAZINE.

FEBRUARY, 1864.

Iron Making at the Königshütte Works, in the Harz.

IN No. 43 of last year's *Berg- und Hüttenmännische Zeitung*, Herr O. Groos contributed a detailed memoir on the management of the working of the Königshütte blast-furnaces, especially with reference to the chemistry of the operations. Although only of local interest, the memoir is useful as furnishing an example as to how superior iron may be produced, with charcoal, from inferior ores.

There is one furnace in blast, worked with charcoal, in which two different qualities of iron are produced: a mottled foundry pig-metal, highly estimated for ornamental castings, but from which bar-iron of only a very ordinary quality can be manufactured; and a grey pig-metal, used for making wire and nail-rods. These distinct qualities of metal are produced by mixtures of ores of different sorts, smelted with varying proportions of flux, and at different temperatures.

The Königshütte establishment is divided into three branches, arranged to suit the distribution of the water-power. The first branch, where the water has an 18' fall, includes 1 Blast-furnace, 2 Finery-furnaces, together with Rolling-mills and Fitting-shops; the second branch, where there is a fall of 14½', includes 3 Puddling-furnaces, 4 Heating-furnaces, 1 Finery-furnace, 1 Refinery, with Fitting-shops; and the third branch, with a fall of 12½', includes 1 Finery-furnace, and Wire mills.

IRON ORES.—The author commences by giving a detailed account of the iron-ores used, the greatest proportion of which are red and brown hematite (principally the former) containing a good deal of silica, and but very little manganese. This he does according to the eight localities from which they are obtained:—

1. The *Lauterberger* ores occur as veins of red hematite in the Silurian grauwacke and clay-slate, associated with porphyry, calc-

spar, chalybite (spathose iron) quartz and baryte. In this locality there are three workings: Knollen, Kummelsglück, Wilde Taube.

2. The *Andreasberger* ores likewise occur as veins of red hematite, mostly in the Silurian grauwacke, associated with nearly the same accompanying minerals as at Lauterberg, but of a purer quality and less mixed with baryte. There are also three workings in this locality: Eisensteinsberg, Königsberg, Bärenthal.

3. The *Elbingeröder* ores, which at the surface are principally brown hematites, but in depth become siliceous and calcareous red hematites, occur to the north of Elbingerod between the clay-slate and the Devonian Limestone. There are numerous workings in this locality, the most important of which is at Tönnchen, where the red hematite is of very superior quality, being free from injurious admixtures, and containing such a proportion of lime as to make it very valuable for mixing with the other clayey and siliceous ores. At Schwarzengrube, magnetic iron occurs associated with sulphur pyrites.

4. The *Altenauer* ores are raised from seven workings, yielding very varied kinds of ores. At Polsterberg the ore is red hematite which occurs with greenstone in the Stringocephalus limestone, partly in veins and partly in bunches, (often 3 fms. thick), which sometimes strike S.E. and N.W. with the greenstone. The richly fossiliferous limestone is very calcareous, and, besides the red hematite, is at times penetrated by veins of brown hematite. At Kehrzu specular iron occurs passing into red hematite. At Kahlenberg brown hematite occurs very pure in a contact vein, with a foot-wall of Posidonomya limestone and a hanging-wall of Spirifera sandstone, associated with white clay. Magnetic iron is met with at Spitzenberg, in small bunches at the junction of greenstone and the altered slate. At Bruchberg iron ochre is found, ranging in colour from bright-yellow to blackish brown. The other workings in this locality are Haverlah and Neue Strasse.

5. The *Lerbacher* ores are red hematites and occur in spheroidal and prismatic bunches, with a vein-like bearing, generally near the junction of greenstone and the stratified rocks.

6. The *Gittelder* ores are brown hematite and spathic ores, which, at Iberg, are found in bunches associated with manganese and baryte, while at Gegenthal the baryte is absent, being replaced by a considerable quantity of quartz.

7. The *Zorger* ores, which are principally red hematites, and the very pure variety of brown hematite called by the Germans "glaskopf," occur in veins at or near the junction of the greenstone and the grauwacke. A siliceous red-hematite is also met with here, but being very poor and difficult to fuse, it is no longer used.

8. The *Ilfelder* ores are red hematites, found in veins in porphyry frequently accompanied by specular iron, manganese ores, baryte, chalybite, iron pyrites, quartz, jasper, and chalcedony.

From this description it will be seen that the ores smelted at Königshütte are poor in manganese; and that the Lauterberger ores, notwithstanding the most careful preparation, always contain a notable proportion of baryte. With respect to the earthy matters they contain, these iron ores may be classed as follows:—

a. *Siliceous* ores more or less difficult to fuse, containing baryte, and making both grey and white iron.

b. *Siliceo-argillaceous*, containing quartz, calc-spar, and chalybite, more fusible than the above.

c. *Calcareo-siliceous*, with chlorite and traces of copper pyrites, difficult to fuse, and making grey iron.

d. *Siliceo-talco-argillaceous*, easily fusible, making white iron; and

e. The *Silicated* slag or cinder, which is easily fusible but difficult to reduce, and contains sulphur.

FURNACE OPERATIONS.—The distinctive arrangements adopted to secure the make of the two qualities of metal mentioned may be described as follows:—

I. The *Mottled foundry pig-metal* which is fluid and tough, making fine castings, is produced without any limestone flux by merely mixing in proper proportions the siliceo-argillaceous ores of Lauterberg and Andreasberg with the calcareous ores of Elbingerod. The analysis of a charge made during the month of April 1862 gave the following average composition:—

Fe ² O ³	Al ² O ³	Ca	Mg	Si	Ö	H	S
43·57	3·23	17·91	0·62	18·23	14·04	1·12	0·31

Showing a ratio between the acid and the earthy bases of—

$$\text{Si} : \text{Al}^2\text{O}^3 : (\text{Ca}, \text{Mg}) = 45·59 : 8·08 : 46·33$$

Two other charges made in September of the same year gave—

Fe ² O ³	Al ² O ³	Ca	Mg	Si	Ö	H	S	Ba
43·644	3·525	19·470	0·875	16·304	15·268	1·353	0·407	—
43·23	3·12	18·34	0·96	18·12	14·47	1·24	0·31	0·36

Showing the respective ratios between the acid and the earthy bases of—

$$\text{Si} : \text{Al}^2\text{O}^3 : (\text{Ca}, \text{Mg}) = \begin{cases} 40·61 : 3·52 : 44·32 \\ 44·30 : 7·63 : 48·07 \end{cases}$$

The charge is therefore, no doubt in consequence of its containing baryte (sulphate of baryta), more basic than the most fusible compound given by Bodemann which showed a ratio of—

$$\text{Si} : \text{Al}^2\text{O}^3 : \text{Ca} = 56 : 14 : 30$$

The following are the dimensions of the blast-furnace used for smelting these charges:—

* Height from the foundation to the throat	37	0
„ bottom of the hearth to the throat	35	0
„ top of boshes (or the belly) to the throat	27	3
Diameter of throat	5	6
„ at belly, or top of boshes	7	3
Depth of boshes	2	9
„ hearth	5	0
Diameter of hearth at top	2	5
„ bottom	1	8
Height of twyers from bottom of hearth	1	3

* The dimensions are in Hanoverian feet which equal 11·45" (nearly 11¼") English.

Length of crucible from the dam-stone to the opposite side of the hearth	5	0
Width of the fore-hearth	1	5
Height from the bottom of the hearth to under the tympan ..	1	4
Diameter of twyers	0	2½
„ nozzles	0	2½ to 2½'
Inclination of twyers	12°	
„ nozzles	7°	

The axes of the twyers are 10' apart.

The charcoal used for smelting is made from beech and pine, the former weighing 9 lbs. and the latter 6·6 lbs. per cubic foot.* The blast is heated to 250° Cent. (482° Fahr.) and is blown through the 2½" nozzle, with a pressure of from 10 lines to 1½" of mercury, when but one twyer is in use, and a pressure of 2" when two twyers are in use. About 340 cubic feet of blast per minute are thrown into the furnace with one twyer. Each charge consists of 220 lbs. of charcoal, and 7½ cubic feet of other materials; and which, working with one twyer, should give a daily make of from 55 to 65 centners (3 tons to 3¼ tons) of pig-iron, and 120 centners (6 tons) of slag, from 23 to 25 of such charges will pass through the furnace in twenty-four hours: on an average 100 lbs. of carbon are charged to 275 lbs. of other materials. On week-days the mottled foundry-pig is made, and on Sundays the grey pig-metal for nail iron. The chemical composition of the superior and ordinary kinds of the former pig-iron, and of their furnace-cinder, is as follows:—

Pig-iron.			Furnace-cinder.		
	Superior.	Ordinary.		Superior.	Ordinary.
Carbon (chemically combined) ..	0·982	2·021	Si	53·25	56·90
Graphite	1·871	0·767	Al ² O ³	14·64	15·77
Sulphur	0·048	0·081	Ca	29·47	21·69
Phosphorus	0·163	0·213	Mg	1·86	1·63
Silicium	3·445	2·934	Mn	0·66	0·20
Manganese	tr.	tr.	Fe	0·56	4·22
			S	0·41	0·22

Showing in the furnace-cinder the respective ratios, for the superior and ordinary pig-metal, between the acid and the earthy bases of—

$$\text{Si} : \text{Al}^2\text{O}^3 : \text{Ca} = \begin{cases} 3·6 : 1 : 2·2 & \text{for the superior} \\ 3·61 : 1 : 1·77 & \text{,, ordinary} \end{cases}$$

This pig-iron (which is used both for foundry purposes and for the manufacture of bar-iron) is admirably fitted for the former by being so fluid and consequently making such fine castings, as well as by not showing graphite, not solidifying too quickly, nor forming cavities. It is fine-grained and of a bright light-grey colour. In manufacturing it into ordinary bar-iron, it is treated in a finery-furnace

* The Hanoverian pound equals 1·07 pound English.

and melts readily; but it is inclined to be red and cold short, and is rather difficult to forge. The forge-cinder flows thickly, and, cooling quickly, the interior becomes stoney in consequence of its high percentage of lime.

II. The *Grey (Wire or Nail) pig-metal* is made from ores selected so as to avoid any admixture of baryte, and which are fluxed with quick-lime. Formerly this flux was also used in making the mottled foundry-pig, but, notwithstanding the greater cost of carriage, it has been replaced by the calcareous iron-stone of Elbingerod. A charge for making this grey class of pig-metal, made during the month of September 1862, gave:—

Fe ² O ³	Al ² O ³	Ca	Mg	Ö	Si	H	S
43.88	3.64	17.63	0.42	13.83	18.75	0.71	0.28

Showing a ratio between the acid and earthy bases of—

$$\text{Si} : \text{Al}^2\text{O}^3 : \text{Ca} = 46.37 : 9 : 44.63$$

Another charge during the same month gave:—

Fe ² O ³	Al ² O ³	Ca	Mg	Ö	Si	H	S
44.523	4.000	17.428	0.940	13.694	17.190	0.486	0.290

Showing a ratio between the acid and earthy bases of—

$$\text{Si} : \text{Al}^2\text{O}^3 : \text{Ca} = 43.46 : 10.12 : 46.42$$

In working the furnace for this grey pig-metal, the method adopted differs from that described as employed in the making of mottled foundry-pig in the following respects:—

The blast is heated only to from 100° to 110° Cent. (212° to 230° Fabr.), and with the 220 lbs. of charcoal 8½ cubic feet of other materials are charged. With one twyer, the pressure is from 8 to 14 lines of mercury; with two twyers, it is from 14 to 20 lines. The two qualities into which this pig-iron is classed and their respective furnace-cinders have the following composition:—

Pig-iron.			Furnace-cinder.				
	Superior.	Ordinary.				Superior.	Ordinary.
Carbon (chemically combined) ..	0.550	1.971	Si .. ..	..	..	54.35	57.79
Graphite	2.437	0.934	Al ² O ³ .. ..	..	..	14.92	12.35
Sulphur	0.009	0.019	Ca .. ..	..	..	28.18	24.67
Phosphorus	0.067	0.093	Mg .. ..	..	..	1.32	1.01
Silicium	3.154	2.756	Mn .. ..	..	..	0.52	0.26
Manganese	tr.	tr.	Fe .. ..	..	..	0.62	4.37
			S .. ..	..	..	0.20	0.20

Showing in the furnace-cinders the respective ratios, for the superior and ordinary pig-metal, between the acid and the earthy bases of—

$$\text{Si} : \text{Al}^2\text{O}^3 : \text{Ca} = \begin{cases} 3.7 : 1 : 2 & \text{for the superior} \\ 4.68 : 1 : 2.55 & \text{,, ordinary.} \end{cases}$$

This class of pig-metal is superior to the class of mottled foundry-pig already described. It solidifies slowly, with a bright white lustre; and when broken exhibits a fine grained texture, a medium grey colour, and a bright fracture—not unfrequently showing graphite. When refined with charcoal, it furnishes an excellent material for the manufacture of wire and small arms; melting with difficulty, but being very fluid, and furnishing a soft tough fine-grained iron, which seldom shows either red or cold short. The ordinary portion of this pig-metal is made into merchant iron. The forge-cinder differs little from that produced from treating the foundry-pig, but is more fluid.

Notice on a Remarkable Discovery of Rich Argentiferous Ores near Freiberg.

BY C. A. SICKEL.*

A RATHER interesting occurrence has been recently observed at the "Alte Hoffnung Gottes sammt Beständigkeit Erbstolln" mine, near Freiberg.

In the year 1859, this mine was in rather precarious circumstances, the only promising point being the "Unverhofft Glück Spat" lode which had been seen for but a short distance at the "Tiefe Hülfe Gottes Stolln" level, and was then being driven to at No. 6 level, by a cross-cut extended on a flat barren cross-course, never opened on but for the purpose of getting at the workable lodes. In the course of the year the lode was reached and commenced to be opened on eastward by a level, which, just before the end of the year, intersected another lode bearing E. of N. (and consequently caunting the "Unverhofft Glück Spat"), the existence of which had hitherto been wholly unknown. The present very flourishing condition of the mine is entirely due to the discovery of this latter lode, which has been named the "Neu Glück Stehende," and which it is our object to describe here.

This lode, which varies from 2' to 2' 6" in width, belongs, like the greater number of those in the district, to the Noble Quartz (*Edel-Quarz*) formation—the mass of the vein-stone being made up of Gneiss, Quartz (both of the ordinary white kind as also of a blueish-grey hornstone variety, which latter predominates), with smaller proportions of brown-spar and calc-spar, the whole being very much intermixed with sulphur pyrites. The ores of economic value met with are—black and red blende (the latter rare), both moderately rich in silver, sometimes amounting to 0.6%;† Galena, Argentite

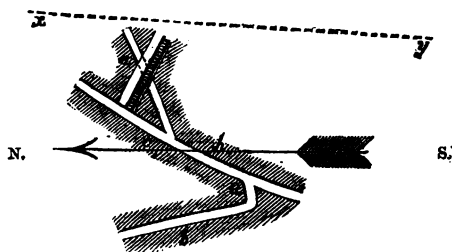
* *Berg- und Hütten. Zeitung.* Nr. 39, 1863.

† "60 Pfundtheilen im Centner."

(*Glaserz*), and Pyrargyrite, or Ruby Silver (*Rothgültigerz*), Stephanite, or Brittle Silver (*Sprödglasserz*), and Native Silver in small quantities. The country is gneiss, almost invariably of a light green colour, with little mica or white quartz, but a considerable proportion of felspar generally rather decomposed. The green colour seems to proceed from a small admixture of chlorite. The country is also much intermixed with pyrites, and has altogether the appearance of being particularly congenial for making ore.

The general bearing of the new lode is N. 33° E. ($2\cdot2$ horæ); but, from the point of its intersection with the "Unverhofft Glück Spat," it is heaved north, and runs with it for some length (see Fig. 6)—the junction having the effect of considerably increasing the productiveness. After driving for a length of some fathoms both N. and S. on the new lode, in order to open up the ground for working, a rise was commenced to be put up to the north of the heave, which at present is up some fathoms above the 5th level—showing in its upper portion the peculiar conditions we are about to describe.

FIG. 6.



Ground Plan.

- a. "Unverhofft Glück Spat."
- b. Flat barren cross-course.
- c. "Neu Glück Stehende."
- h. Heave.

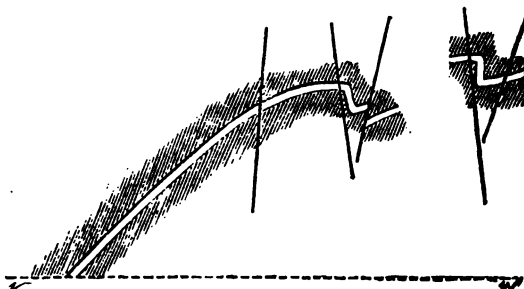
x.....y. Bearing of the "Neu Glück Stehende" at the second heave.

The average dip of the lode at the beginning was 48° W., and the rise was put up to a height of 32 fms. with this inclination. Here it was intersected by a slide or cross-course, bearing N. $19^{\circ} 30'$ E., and dipping 80° W., which, without causing any heave of the lode, effected a considerable alteration in its dip, and in its metallic contents. Above this cross-course or slide, the lode became suddenly much flatter, only dipping 22° (see Fig. 7). And while below it principally produced blende, having not unfrequently a thin coating of argentite (*Glaserz*), and galena in considerable bunches or in veins several inches wide; so that the first stopes from the rise yielded rich crop work; above this point these ores, although they did not entirely fail, contracted to a narrow string scarcely half-an-inch wide at the sole, all the vughs, or open fissures in the lode becoming thickly coated with *Glaserz*. After the lode had been extended on with this slight dip for a length of 5 fms., it again suddenly changed its inclination, this time without the intervention of any slide or

cross-course, becoming perfectly horizontal—so that the rise gradually became a level. After driving thus for $1\frac{1}{2}$ fms., a second slide or cross-course was met with, bearing N. 25° $30'$ E., and dipping 80° E., which completely cut off the lode and rendered a new search for it necessary.

FIG. 7.

FIG. 8.



Transfer: Section, showing rise.

r.....w. Level of sole of No. 6 level.

Calculating on a regular heave, and assuming consequently that the dip of the lode on the other side would be but trifling, it became clear that if the lode were to be found by driving a level, this level would probably have to be extended a considerable distance; so that, instead of driving, a sinking was commenced through the floor or foot-wall, which intersected the lode after being put down $1\frac{1}{2}$ fms. The lode was here found to have an inclination of 18° W., with a thickness of 2' 6"; and, although considerably poorer than before the heave, still yielded very good stamps-work, and near the roof good crop ore. After this had been extended on nearly horizontally for 1 fm., a third slide or cross-course was met with, bearing N. 9° E., and dipping 70° W., which not only caused a partial heave, but also affected the bearing of the lode. While in the workings to the south the lode has a downthrow of $\frac{1}{2}$ fm. (as shown in Fig. 7), in those further northward no heave is observable, the lode continuing its course perfectly undisturbed, as shown in Fig. 8. Neither is the change in the bearing inconsiderable, for the original average bearing of the "Neu Glück Stehende" of N. 33° E. is found to have passed into one of N. 15° E.

As to the dip of the lode above this, it seems to continue at a pretty regular angle of 30° W.; and the ores again become similar to those met with in commencing the rise from the 6th level—being throughout fine crop ore, principally galena—except that the lode seems to have become even richer than before in argentite (*Glaserz*) and pyrrargyrite or ruby silver (*Rohtgültigerz*). The whole character of the lode, as well as of the country, appears so congenial and promising, that there seems every reason to hope that these rich ores may continue to hold out for some considerable time longer; and it certainly is such as to induce a vigorous trial of the lode at other points.

NOTE.—This discovery of rich ores of silver in connection with a series of cross-courses and heaves is very interesting when compared with a similar occurrence of like ores at Wheal Ludcott mine, near Liskeard, in Cornwall, which was described in our *Magazine* in August, 1862 (No. 8, vol. ii, p. 78). The silver ores discovered at Wheal Ludcott, like those found at “*Alte Hoffnung Gottes sammt Beständigkeit Erbstolln*,” were chiefly argentite, pyrargyrite, and native silver; and there was an undoubted connection between their deposition and the occurrence of a series of intersections and heaves very similar to those described in the above Notice.—ED. M. & S. M.

The Tin Stream-works of the Island of Carimon.

THE island of Carimon, where alluvial deposits of tin have been lately discovered, lies in the straits of Malacca and forms a natural connecting-link between the stanniferous highlands of Banca and Billiton and those of Malacca. The area of the island is about 140 square miles—the southern portion of which is a plane, while the northern portion is very hilly, at some points rising rapidly from the coast to an elevation of from 1,200 to 1,500 ft.; and the whole is very thickly wooded.

The prevailing rock is granite (protogine) generally fine grained. After the granite, the most abundant rock is one composed of a mixture of Quartz and very light coloured Mica (the *Greisen* of the Germans), which is found sometimes coarse-grained, sometimes fine-grained, and sometimes even compact, and which contains oxide of tin in abundance, often in twin crystals: at one point this *Greisen* is found penetrating the granite as a dyke. Boulders of schorl-rock are also found, so that this rock probably occurs in abundance, although it has not yet been met with *in situ*. On the north coast, a variety of hornstone rock occurs; and at the extreme southern points, most distant from the hilly country, boulders of Aphanite* are found on the beach. Numerous quartz veins are met with; and although no tin has been found in these at their outcrop, it is not improbable that their disintegration, as well as that of the *Greisen*, has helped to make up the alluvial tin deposits, inasmuch as tin stone is frequently found associated with quartz in the stream-works.

The southern and level portion of the island, the greater portion of the coast, and the valleys in the mountain district, consist of alluvial deposits made up of sand and kaolin, and in these the tin stream-works are generally met with, in the sand. Besides the tin ore, small regular crystals of pyrite, and sometimes rounded grains of

* *Aphanite* or *Melaphyre* is a compact fine-grained rock of the Trap family, of a dark-green, brown, or black colour, of uncertain composition, but principally made up of a felspathic mineral, intimately mixed with a large proportion of hornblende, angite, magnetite, &c.—ED. M. & S. M.

pyrolusite (anhydrous oxide of manganese) are found in the washings. In one creek a large block of granular quartz was found containing compact Gersdorffite (nickel-glance).

For a long period the native Malays, and a few Chinese, had been in the habit of procuring, and offering for sale, small quantities of tin-ore, which they obtained from the more elevated defiles among the hills, where, the covering being thin and the inclination of the ground steep, pumping was unnecessary. In their manner of proceeding, the brook was carried with the stream-work and made to do the labour of bearing away the overlying sand until the ore-deposit was met with, when the flow of water was lessened for the more careful washing. This rude system could however only be continued for a short time, and was incapable of extension; while the numerous boulders met with in these defiles, and the very local extent of their tin deposits (which were confined to the sharp bends of the valley), rendered the working in these localities troublesome and uncertain.

When therefore about two years ago a Dutch company undertook mining in the island on a regular scale—under the direction of Herr Robert Dach, to whom we are indebted for this paper—these old stream-works in the high valleys were abandoned, and new workings commenced towards the coast, where the valleys open out wider and become more level. Of course there was considerable difficulty in ascertaining, in a country covered with a pathless and almost impenetrable growth of wood, the most likely localities for mining; particularly as all the streams, after leaving the mountain defiles, usually spread out into wide swamps, which had to be drained by ditches before any workings could be commenced. Shafts could not be sunk in such ground, which consequently had to be opened by

FIG. 9.



trenches dug in terraces narrowing downwards, the walls of which were secured by poles with a backing of woven branches. The Chinese boring-tool, called "scham," is also from time to time used for trials. This is attached to a 1" iron rod, 22' long, furnished with a handle formed of a strong ring 6" in diameter; and consists of a hollow pointed head, opening obliquely upwards, as shown in Fig. 9. When about to be sunk, this hollow is compactly stopped up with rag, to which a string is attached fastened to the handle; so that when the tool has penetrated to the desired depth, the rag may be pulled out, and the tool become filled with the stuff about it.

The drainage is effected by wooden pumps and by barrels. For very shallow depths a highly primitive process—similar to that in use in Egypt—is practised, in which two men stand opposite to each other with ropes, and pull up the water in a shallow closely-woven basket of from 4' to 6' square.

The stream-works thus opened out extend to a depth of from 20' to 40', and are now worked by large rectangular drifts driven against the course of the stream, the exhausted portions of which are filled up with the more recently excavated waste. The tin-stuff is first trunked roughly in the workings, and, after a considerable pile of this partially cleaned work is collected, it is finally washed clean in a buddle with a long-handled broad rake. The other tools and implements required are all very simple.

The only workmen employed here, as in the East Indian mines generally, are Chinese. At each stream-work ten of the older miners, called "Kapallas" (or bargain takers), have the control of the rest of the men, who are only day labourers (coolies). Each kapalla receives monthly, as subsist, a stipulated quantity of rice, oil, fish, tobacco, and money (sufficient for the supply of himself and labourers); as well as a certain allowance of clothing and tools. All these are charged to the account of the kapallas, who must pay for them in tin: if they return more than sufficient to pay the advances, they receive the balance in cash. The coolies are engaged for a year, and as they receive the whole amount of their wages in advance, it is not surprising that many of them attempt to run away as soon as they have been paid. When such an event occurs, the Malays form a party for hunting down the fugitive, as a reward is given on bringing him back. The Malays are useless for hard work, but are employed as overseers under the kapallas; for although they are neither so skilful nor so intelligent as the Chinese, they know how to make themselves respected by them.

Herr Dach mentions, as a curious fact, that the Chinese have the same superstition as their brethren in the old European mining districts against whistling in a mine, which is supposed to drive away the ore.

French Mechanical Apparatus for Working Pattinson's Desilverising Process.

By DR. FEHRBS.*

PATTINSON'S process for concentrating the silver in argentiferous lead has hitherto been carried out by melting the original lead in iron pots, which are subsequently cooled by removing the fire and carefully throwing water over the surface of the melted mass; by which means, as the temperature is reduced, crystals are formed containing less silver than the remaining molten mass. These crystals are removed from this molten mass by means of a perforated iron ladle worked by two men, one of whom shakes it and, by thus compressing the crystals, frees them as much as possible from any admixture of molten matter. This process is facilitated if, as in the works of the Upper Hartz, both sides of the pot are ladled from—as is customary at many of the English works, where the ladle full of crystals is removed from the pot by mechanical appliances. The crystals, being well drained of any molten matter, are carried over to the next pot to the left, melted again, and the ladling process repeated. The liquid mass or alloy remaining is treated similarly, and ladled into a pot to the right. By frequently repeating this

* *Berg- und Hütten. Zeit.* Nr. 1, 1864.

process, a highly concentrated silver lead is obtained ready for refining by cupellation, and also a lead as free as possible from silver fit for the market.

According to the system of crystallising chosen, and the percentage of silver in the lead to be operated on, a varying number of pots are necessary to effect the required desilverisation. Thus, for example, at the works of the Upper Hartz there are thirteen pots for lead containing .17% to .18% of silver (60 ounces to the ton) from which highly concentrated argentiferous lead, containing from .7% to .75% (250 to 270 ounces to the ton), and a desilverised lead containing on an average not more than .00251% of silver (less than 1 ounce to the ton) is obtained. The process thus carried on requires numerous workmen, and consequently a heavy expense in wages, for very large masses of lead have to be operated on. It has therefore been frequently attempted to replace this manual labour by mechanical appliances, but hitherto without attaining the desired object. Among such attempts may be mentioned that of Mr. B. Worsley, who proposed straining off the liquid from the crystals by the bottom of the pot, which has not however been found effectual on a large scale.

During a brief mining tour, I have recently had an opportunity at Holzappel, in Nassau, of becoming casually acquainted with the recently introduced so-called *French Mechanical Pattinson Process*, which in respect of its mechanical appliances is certainly more effective than any apparatus of the kind hitherto suggested. In giving the following hasty sketch of this apparatus, which I became acquainted with merely accidentally, I must beg it to be understood that the dimensions given have no pretensions to strict accuracy, as I had only the opportunity of observing the apparatus for a short time. Neither can I answer for the perfect accuracy of the data given, since they are partially founded on estimates.

The apparatus consists essentially of two parts—the set of concentrating pots, and the stirring apparatus, worked by a portable engine of $4\frac{1}{2}$ H.P.

There are two pots, A and B (*see* Plate I), the first of which is called the melting-pot, and the second the crystallising-pot. The former, which has a capacity of nearly double that of the latter, is about 5' in diameter and 3' deep; and, on the side next the crystallising-pot (B), is fitted with a discharging pipe *a*, tightly closed by a slide valve *b*, through which the molten lead flows into the crystallising-pot—the top of which is situated lower than the bottom of the melting-pot.

The crystallising-pot consists of the pot itself (B) and the associated stirring apparatus C. The pot has two discharge-pipes, *d*, *d'*, in the bottom, also tightly closed by the slide valves *e*, *e'*, both of which pipes are heated by a small separate fire *f*, to prevent their being obstructed by the cooling the lead. Through these pipes the enriched lead flows off, while the desilverised lead crystals remain in the pot.

The stirring apparatus C consists of the two vertical axles *w*, *w'*, standing in the pot B, the first of which, *w*, is hollow throughout, and the second, *w'*, inserted in this. Each axle has attached to its

upper end the conical toothed-wheels r , r' , to which a third, r'' , is connected, by means of which the motive-power is transferred by a driving band to the two axles, $w w'$. To the lower end of each of the axles, $w w'$ (which it is evident from what has been stated must revolve in opposite directions) there are connected—to w' the iron stirrer p , and to w the knives m and m' , which almost touch the sides of the pot, and protect them from incrustations of lead. The object of the stirring is to promote, throughout the whole mass, the uniform temperature necessary for crystallising the lead; and sufficiently to compress the crystals formed as to separate them from the liquid alloy.

It is evident that, with increasing quantities of crystals, the friction of the stirrer and the knives on the sides of the pots will become greater and greater; and that when a certain quantity of crystals has accumulated this friction will be increased to such a degree that the power of the engine will be insufficient to overcome the resistance—and that consequently the operations must come to an end, if indeed the engine be not so powerful that it will work until the pot bursts. For this reason the pot should be of considerable strength, even when the power of the engine is not too great, as in the present instance.

These conditions may be applied to any system of crystallisation—to that of reducing the alloy to one-third, or to one-eighth. For example, when the alloy has to be reduced to one-third, such a power is given to the engine as shall ensure the stoppage of the whole apparatus as soon as two-thirds of the lead shall have been crystallised; and similarly, in the one-eighth system, when seven-eighths of the lead shall be crystallised.

The arrangement of the apparatus also includes the two round pots, D and D, on either side of the crystallising pot (B) opposite the openings of the discharge-pipes d, d' , in which the liquid alloy is collected as it flows off. Connected with these, on each side of the apparatus, is a crane, by means of which the enriched metal is lifted out of these pots and brought again to the melting-pot A to be further enriched.

The pots are heated by the fire-place F, from which the products of combustion pass through the whole length of the apparatus to the chimney E. The cover M is lowered when the stirring commences, so as to protect the workmen from the injurious effects of the lead fumes.

Having thus described the essential parts of the apparatus, I shall now say a few words on its mode of working.

I have not information which would enable me to state the system of enrichment followed at Holzappel; but this is a matter of minor importance, as the arrangements are equally suitable for either the one-third or one-eighth method. Assuming the one-third method to be that adopted, we would have the following classification of the results:—

05; 04; 03; 02; 01; ①; 1; 2; 3; 4; 5; 6; 7; P;
in which class 05 is the very highly enriched lead afterwards cupelled;
class ① the original lead; and class P the poor desilverised or market

lead. Such a quantity of original lead must be melted as will correspond to the capacity of the crystallising-pot; and as soon as this is effected, the pipe *a* is opened to allow of its flowing into the pot B, when the stirring apparatus is set in motion with a power duly proportionate to the friction to be overcome, assuming the one-third system of crystallisation to be adopted. By lowering the temperature, which is effected by covering the surface of the melted mass with powdered charcoal upon which water is sprinkled, a very rapid crystallisation is brought about at Holzappel. When the crystallisation has proceeded so far that the stirring apparatus becomes stopped, the steam is shut off from the engine, and the two discharge-pipes *d'* *d*, are opened; by which means the liquid alloy flows off into the side-pots D D—the crystals remaining behind. The one-third system being that adopted, this liquid alloy will amount to one-third of the whole mass of the original charge, and the crystals to two-thirds; at Holzappel two blocks of enriched lead are obtained, each weighing from 20 to 30 ctrs.* This enriched lead may now be classed as 01, and the crystals as 1. Lead (of the same percentage of silver as the crystals 1) is now melted in the pot A, in such a quantity as to make up, with the crystals remaining in the crystallising pot B, a sufficient charge for that pot—which will be a quantity equal to one-third of its capacity. This melted mass is again crystallised; when the liquid alloy obtained corresponds to class 1 and the crystals to class 2. Repeating this operation always with lead of the same class, we ultimately obtain a concentrated enriched lead, corresponding to class 05, ready for cupellation; and desilverised crystals corresponding to class P, ready for the market.

The process can be continued, with unbroken regularity, when the pots have once got into full working condition, provided the engine has a power properly proportioned to the system of crystallising adopted. From what has been said, the pots may be described as in full working condition as soon as there exists sufficient of each class of lead to make, with the crystals remaining in the crystallising pot, a full charge for that pot—with the exception of course of the class preceding that to which the crystals in the pot belong, of which none exists.

When I visited Holzappel the apparatus had not yet got through a complete charge; but I was assured that, so far, it had answered very well—so well that it was intended to erect another the following year.

It is not yet ascertained whether this process is applicable to thirteen or more pots, which is a question that must be solved in the future.

NOTE.—This French process has attracted a great deal of attention on the Continent, and an apparatus on something the same plan has recently been erected at Messrs. Enthoven's lead works, Rotherhithe, London, under the direction of Messrs. John Taylor and Sons.—ED. M. & S. M.

* A Centner is about 1 cwt.—ED. M. & S. M.

Ziervogel's Method of Extracting Silber.

BY R. WAGNER.*

AUGUSTIN'S method of extracting silver, which was effected by roasting the ground copper-regulus with chloride of sodium, so as to form metallic chlorides, that were then dissolved in a solution of common salt from which the silver was subsequently precipitated by copper, and the copper by iron,—formerly in use at the Mansfeld copper works, has been now replaced by that of Ziervogel, who roasts the ground regulus to a sulphate of silver, then lixiviates with hot water, and afterwards precipitates the silver by copper. The operation is divided into three distinct processes:—

- I. The calcination of the ground copper-regulus;
- II. The lixiviation and formation of the silver precipitate;
- III. The drying and refining of the silver.

I. CALCINATION OF THE GROUND COPPER REGULUS.—This, which is effected in double-bedded reverberatory furnaces, is the most difficult portion of the whole process, and is divided into two stages: 1st, the oxidation of the sulphides, that is, their conversion into sulphates; and 2nd, the decomposition of these sulphates at a higher temperature, so that FeO, SO^3 decomposes first, then ZnO, SO^3 , and lastly CuO, SO^3 , while the AgO, SO^3 remains unaltered.

In the first stage, the ore is charged to the upper bed, which has no fire-place (*blinden Ofen*), but which is heated by the furnace below. The charge is composed of 497 lbs. (German) of ground copper-regulus (*Spurstein*); 50 lbs. of the richer residues of the desilverising vats (that is, those containing more than 18 grans—17 grains English—per centner); 37 lbs. of lixiviated regulus, clotted together during former calcinations; 4 lbs. of silver scrapings that have been lixiviated and roasted three times; and 4 lbs. of the lixiviated bed of the furnace. Half the richer residues are first spread evenly over the upper bed, since, being almost pure CuO , they do not readily adhere; upon this, half the ground regulus is charged; then the clotted regulus and the silver scrapings; then the remaining half of the richer residues; and lastly, the other half of the ground regulus. The charge is regularly stirred for from four to five hours, to prevent the agglomeration of the sulphides, and to expose every portion to the air. After this, 20 lbs. of coarse lignite slack are spread evenly over the charge, the whole being then well mixed by stirring. The lignite is soon completely ignited, and after its flames are extinguished the charge is passed through the communication in the floor on to the under bed, during which operation the dampers of the flues must be completely closed. On this lower bed the charge continues to be stirred for from one and a-half to two hours, without any addition of fuel—an operation which is

* From the *Chem. techn. Jahresber*, vii. Jahrg.

called the cooling (*Kaltmachen*), and which effects the complete oxidation of the ground regulus. After one hour's stirring, the charge is turned over for the first time, and then again at the end of another hour, when it is at a dark red heat. A test sample now taken shows scarcely any traces of iron, but a considerable proportion of copper and silver; while one taken immediately after the charge was brought on the lower bed showed (when dissolved in water with chloride of sodium) a greenish colour, without any precipitation of silver. The turning-over is effected by heaping up in the middle of the furnace the charge of one-half of the hearth, on which the charge on the other half is then spread out, the heap being afterwards spread over the second half.

The second stage, or dead-roasting, by which the sulphates are partially decomposed, is now commenced, the heat of the furnace being slowly raised to a high temperature, while the charge is kept well stirred all the time. On the completion of the roasting, which is first effected near the fire-bridge, a test sample shows a bright blue colour, and gives a considerable precipitate of chloride of silver. The completely roasted charge is now riddled, from 50 lbs. to 60 lbs. of which remains behind as clotted ore. Three men are employed at the lower bed, and two at the upper. The sulphur fumes are very injurious to the breathing of the men, which increases the difficulties of working.

Chemistry of the Process.—The ground copper regulus consists, essentially of Cu^2S , FeS^2 , Pb^2S , ZnS , AgS , with MnS , NiAs , CoAs , SbS^3 , AsS^3 . The FeS^2 first oxidises in the upper bed (*blinden Ofen*) upon which SO^2 is given off, while FeO, SO^3 remains. Similarly CuS oxidises to CuO, SO^3 , upon which SO^2 is likewise given off. AgS is not altered in the upper bed; nor could it indeed, by itself, be converted into AgO, SO^3 even by the most careful roasting. This can be effected however in the presence of the sulphides of other metals, through the decomposition of their sulphur salts, and the consequent liberation of sufficient O to allow of the conversion of the AgS into AgO, SO^3 . The heat arising from the combustion of the lignite decomposes the FeO, SO^3 , while the CuO, SO^3 and AgS remain unaltered; for, of these three metals, the most easily oxidisable is the Fe, then the Cu, and last the Ag. The FeO of the decomposed FeO, SO^3 oxidises to Fe^2O^3 , and the Cu^2S passes completely into CuO, SO^3 . At this stage of the process the under hearth is heated, when the CuO, SO^3 is decomposed into SO^2 and CuO , which decomposition however is not complete, as the AgO, SO^3 may now perhaps begin also to decompose.—So much for the roasting-process, after which follows the lixiviation process. The mass now to be treated contains the Ag principally as AgO, SO^3 —the Cu as CuO —and the Fe as Fe^2O^3 : it will be well if all the FeO is oxidised to Fe^2O^3 , for FeO readily takes up the AgO, SO^3 ,—both as O as well as SO^3 —leaving the metallic silver behind.

(To be concluded in our next.)

Abstracts and Reviews.

GEOLOGICAL SOCIETY OF MANCHESTER.

At the last monthly meeting of this Society, on January 19th, Mr. A. Knowles, President, in the chair, a very peculiar paper was read by Mr. Joseph Dickinson, Inspector of Mines for the Manchester District, entitled "Modern and Scriptural Geology," an abstract of which has been published in the *Mining Journal*.

The paper itself would not be remarkable in the columns of that journal, which is so frequently the medium of bewildering its readers by speculations of a kindred character; but (assuming the paper to be correctly abstracted, which we have no doubt is the case) it certainly is not a little curious to see such a production read before a society of the position of the Geological Society of Manchester, by one of the Government inspectors. In justice to the Society it should be stated that Mr. Atkinson and Mr. Hull strongly regretted its having been brought forward, and expressed the hope that, "for the credit of Mr. Dickinson and of the Society," the paper would be withdrawn. In seconding this hope we are quite assured that we are only expressing a wish that will suggest itself to every well-wisher of the Society. The existence of a Geological Society pre-supposes the existence of such a science as geology,—which, if Mr. Dickinson's views were discussible, would be a mere delusion. It is of course quite open to Mr. Dickinson, or any one else, to maintain that geology is a delusion; but the transactions of a Geological Society are not the proper medium for circulating such views. We shall be curious to see if Mr. Dickinson's paper appears in the transactions of the Manchester Society.

In giving the following condensed abstract of Mr. Dickinson's paper, we need scarcely say that we do not admit it to be seriously discussible. We give it rather as a "frightful example."—After referring to his mental struggles between geology and scripture during many years, Mr. Dickinson stated that it was only after repeatedly returning to the subject that he had come to the simple view which he now took. He considered that what he calls "the modern theories" of geology involved many improbabilities. With the exception of pumice-stone, which might be produced by the local spontaneous combustion of some of the productions of the earth, in his view all things appeared to have originally been in a watery state. Even now rocks were so moist that a current of air driven through them becomes saturated; and their soft moist nature was further proved by the striations exhibited wherever their continuity had been dislocated. Again, if the theory of sedimentary rocks were admitted, deposits would all be mixed; limestone, salt, chalk, and other such deposits would never have been found in immense beds. There were no remains of surfaces like that which now covered the earth; no beds of rivers; and, as to the so-called denudation, rocks thousands of feet—nay, even miles—in depth would be wanting to account for the present surface formations. Immense blocks of the denuded rocks would have remained. The pebbles and boulders were insufficient to account for what had disappeared; besides, a striking relationship existed between the pebbles and

the underlying and adjacent strata. These pebbles, he believed, did not drift by glaciers, but were formed on the spot. The scriptural account of the creation led him to suppose that water was the first element; that following the creation of light, which was the first day's work, *expansion commenced* [whatever that may mean]. *Force had thus begun, and with the light apparently came chemical action, electricity, magnetism, heat, motion, and the like. Parts aggregated and repelled, until what we call the firmament was made. The waters then divided, part went above and part went below, the latter being called the earth.* Scripture also told us that every plant of the field and herb of the earth was in the earth before it grew, and this would account for fossil remains in whatever part of the structure of the earth they might be found. The fossil remains of shells were numerous, because "the waters brought forth abundantly;" but the winged fowls, which were created on the fifth day, seemed to have escaped, because they were made so that they might fly. The animals and man seemed also to have escaped, though there were markings of what were supposed to be foot-prints. He considered that the earth was now in the same state as it existed after the "dividing of the waters," and the striations on surface rocks were the result of ordinary friction when in a soft state, when the "waters divided."*

THE BOARD OF TRADE RETURNS.

The "Accounts relating to Trade and Navigation of the United Kingdom, for the month ended 30th November, 1863, and eleven months ended 30th November, 1863," have been issued by the Statistical Department, Board of Trade.

IMPORTS.—The quantities and relative increase and decrease of the imports of metals, metallic ores, and mineral products, for the month and eleven months ended 30th November, have been as follows :—

	Month ended 30th November.			Eleven Months ended 30th November.		
	1862.	1863.	Increase (+) or Decrease (—).	1862.	1863.	Increase (+) or Decrease (—).
Brimstone cwt.	81,421	98,673	+ 14,252	985,794	787,986	— 197,808
Copper Ore tons	5,945	5,208	— 647	72,514	71,068	— 1,446
Copper Regulus "	1,000	2,656	+ 1,656	29,831	19,218	— 10,603
Copper, unwrought and part wrought cwt.	27,360	13,400	— 13,960	243,840	211,980	— 31,860
Iron, in Bars, unwrought, tons	5,970	6,009	+ 39	39,152	42,225	+ 3,073
Steel, unwrought "	260	853	+ 593	3,796	2,887	— 909
Lead, Pig and Sheet "	2,232	2,747	+ 515	19,937	23,538	+ 3,601
Spelter or Zinc "	2,934	3,553	+ 619	17,630	27,735	+ 10,106
Tin, in Blocks, Ingots, } Bars, or Slabs cwt.	5,103	4,749	— 354	67,562	42,405	— 25,157
Silver Ore value in £	3,808	50,965	+ 47,157	273,646	249,256	— 24,390
Petroleum tons	755	470	— 285	14,535	30,899	+ 16,364
Quicksilver lbs	223,635	—	— 223,635	1,067,074	1,152,733	+ 85,659

EXPORTS.—The quantities, declared value, and relative increase and decrease of the exports of metals, minerals, and metallurgical articles of British and Irish produce and manufactures, for the month and eleven months ended 30th November, have been as follows :—

* The italics are ours.—ED. M. & S. M.

ON THE OCCURRENCE OF VANADIUM IN PIG-IRON SMELTED FROM THE WILTSHIRE OOLITIC IRON ORE.

By EDWARD RILEY, F.C.S.*

Some time since samples of pig-iron were submitted to me from two different iron-works in Wiltshire, viz., the Seend and the Westbury. Silicium, sulphur, and phosphorus were the only ingredients whose percentages were required to be determined. To estimate these the usual methods of analysis were employed, viz., oxidising the pig, in small fragments, with fuming nitric acid, adding occasionally a little concentrated hydrochloric acid. The solution was then evaporated to dryness, and heated; the mass then redissolved in strong hydrochloric acid, and the silica separated, the sulphur and phosphorus being determined as described in the Journal of the Society, vol. xvi, page 390 and 391. The following results were obtained:—

The samples of pig examined were all grey, and numbered from No. 1, best foundry, to No. 3; No. 4, best forge, to No. 6 pig, from Seend works.

TABLE I.

No.	Grains of Pig taken.	Silica obtained.	Residue by HF1 & SO ₂ H.	BaO.SO ₄ .	2MgO.PO ₄ .
1 ..	63·14	6·38	·05	·165	1·94
2 ..	63·72	5·03	·08	·360	2·070
3 ..	61·94	4·315	·09	·435	2·125
4 ..	62·41	4·34	·075	·895	1·600
5 ..	62·62	3·11	·085	·730	2·055
6 ..	60·38	2·87	·050	1·095	1·920

Analyses 5 and 6 repeated.

TABLE IA.

A5 ..	23·82	1·335	·16	·215	·74
B6 ..	27·515	1·525	·175	·46	·87

In analyses A5, B6, the oxide of iron was dissolved in the dish in which the first solution of the pig had been evaporated to dryness. The separation of the iron from the silica was not so complete as in the other analyses, when the oxide of iron was detached from the dish and transferred into a beaker in which the oxide was boiled for several hours, the beaker being well covered with a large watch glass. This process is always necessary to separate oxide of iron from silica, and to obtain the silica nearly white after burning. Two samples, No. 1 and No. 5 pig-iron, were from the Westbury Iron Works.

TABLE II.

No.	Grains of Pig taken.	Silica obtained.	Residue by HF1 & SO ₂ H.	BaO.SO ₄ .	2MgO.PO ₄ .
5 ..	61·28	4·23	·43	·20	3·92
5 ..	62·39	3·545	·275	·37	4·095

TABLE III.

RESULTS: SILICIUM, SULPHUR, AND PHOSPHORUS PER CENT.

Wiltshire Pig-Iron (Grey) from Seend.

No.	Silicium.	Sulphur.	Phosphorus.	
1 ..	4·717	·036	·867	} Foundry Pig
2 ..	3·659	·077	·917	
3 ..	3·909	·096	·968	
4 ..	3·140	·196	·724	} Forge Pig
5 ..	2·257	·160	·926	
6 ..	2·197	·248	·898	

* From *Journal of the Chemical Society*, January, 1864.

TABLE IV.

<i>Wiltshire Pig-Iron (Grey) from Westbury.</i>					
No.		Silicium.	Sulphur.	Phosphorus.	
1 ..	..	3.21	.044	1.806	Foundry
5 ..	..	2.67	.081	1.853	Forge

It will be seen that the residues from the silica in Table I are very much less than those in Table II. In Table I the small amount of residue was chiefly phosphate of iron, due to the oxidation of a small amount of phosphide of iron, which is universally left undissolved by the acid, together with the silica. The residues in Table II were nearly white; they were fused with bisulphate of potash; complete solution took place. On dissolving, however, in cold water, a gelatinous precipitate was left; this was filtered off, and the clear solution on boiling gave a precipitate, which was at the time considered to be titanous acid.

In preparing my recent paper referred to above, the pig used in Table II was again examined: it was soon found, however, that the residue from the silica was not titanous acid, although samples were examined by a friend of mine, and by one of my pupils, both of whom also mistook vanadium for titanium.

The method found to be the most advantageous in separating the vanadium from the pig was the same as that employed to separate titanium, viz., by dissolving the borings in dilute hydrochloric acid, and, after the pig was nearly all dissolved, adding some strong acid, and boiling well; the chloride of iron was then filtered off from the graphite and silica, the filter well washed from chloride of iron, and treated with a dilute solution of potash to dissolve the silica; the potash thoroughly washed out; and the filter treated with hydrochloric acid, washed until all the acid was removed, then dried, ignited, and burnt over a Bunsen's burner, or better in a muffle. The residue left was a semi-fused mass, apparently consisting of a mixture of a fusible and infusible oxide, staining a porcelain crucible yellow, and adhering strongly to it, some portions of the mass being of a purplish blue colour, similar to the bloom on a plum.

The following are the residues obtained from different samples of pig from the two above-mentioned localities. It will, however, be seen that the pig from Seend contains less than half that contained in the Westbury pig.

TABLE V.

Westbury Pig-Iron, 1860 (Grey), No. 1, best Foundry.

	Grains taken.	Gave residue.	Residue per cent.
A ..	127.325	.99	.777
B ..	1066.72	8.60	.866
C ..	246.81	2.19	.887

Sample C was dissolved in dilute commercial sulphuric acid; the residue contained a little iron.

Westbury Pig (Grey), No. 5 Forge Pig.

	Grains taken.	Gave residue.	Residue per cent.
C' ..	236.11	2.04	.864

Westbury Pig, 1863, No. 1, best Foundry.

	Grains taken.	Gave residue.	Residue per cent.
D ..	231.25	2.088	.901
E ..	230.455	1.935	.839

Westbury White Pig, 1863.

Grains taken.	Gave residue.	Residue contained a large quantity of oxide of iron
231.655	8.200	
134.81	3.435	

Seend Pig, No. 1, best Foundry, 1860.

Grains taken.	Gave residue.	Residue per cent.
518.4	1.82	.351

The semi-fused residue treated with concentrated hydrochloric acid gave off chlorine, and formed a brownish-yellow solution, which, on boiling, soon became of a beautiful green colour, some amount of a black insoluble residue remaining undissolved in the form of a fine powder. On adding nitric acid, no perceptible change took place, and the heavy black residue did not appear to be at all affected by it. The residue was separated from the black insoluble matter, the soluble portion was evaporated on the water-bath, and the greater part of the free acid evaporated: a syrupy, dark-greenish mass was then left, the sides of the dish being of a brownish colour. On adding water to this, a beautiful blue solution was formed, and a small amount of a white, insoluble, flocculent matter was observed. The solution was green when acid, but blue when free from much excess of acid, or largely diluted with water. On testing this solution, it gave all the characteristic reactions of vanadium-salts, the most marked being the yellow precipitate with ferrocyanide of potassium, which, on standing, acquires a greenish tinge. From the above reaction no iron can be present in the residue. It may be stated that, in the examination of several samples of pig, the graphite has been obtained nearly pure, or mixed with some of the rarer metals occasionally occurring in pig-iron, the oxides of which may be obtained on burning the graphite. For the description of a residue of nearly pure titanitic acid in pig-iron, see the Society's Journal before alluded to, vol. xvi, Table I, page 392.

Examination of the Black Insoluble Matter.—On fusing the substance with bisulphate of potash, complete solution took place; the fused mass, after cooling, dissolved completely in cold water. The solution, heated to the boiling point, gave an immediate precipitate, which settled down as a dense yellowish-white powder. This precipitate was partially soluble in hydrochloric acid, or, if hydrochloric acid were added before boiling the solution, no precipitation took place, thus showing that it was not titanitic acid. The solution, before boiling, gave the distinct yellow coloration with yellow prussiate of potash peculiar to vanadium-salts, although a distinct precipitate was not formed until the solution had stood some time.

This black powder is, most probably, suboxide of vanadium; it does not appear to be oxidised, certainly not to any extent, by fuming nitric acid, and appears to be indifferent to acids generally. The precipitate formed on boiling the solution in bisulphate of potash is a basic sulphate of vanadium. In the various residues obtained from the different samples of pig, the amount of this black residue appeared to be always about in the same quantity. Two determinations were made of the relative quantity of the black oxide, and the results bear out the above conclusion. A portion of residue B (see Table) was weighed out.

Residue B, 3.49 grains, gave black oxide	..	..	1.99
Residue E, 2.085 grains, gave black oxide	..	..	1.105

By proportion 3.49 : 1.99 :: 2.085 : 1.19

The results approximate very closely. It would appear that the amount of residue in the various samples of the same pig, made at different times, is the same in amount, and also in composition. This will be seen on examining Table 5. A and B may be taken as identical in the same pig C, containing a little iron. C', quite a different quality of pig, made about the same time as the previous sample, agrees in percentage of residue very closely; D is a trifle higher, and E about the same. It must, however, be observed that, in treating the residue from the pig, insoluble in acids, a second time with hydrochloric acid, after having removed the silica by potash, the acid acquires a darkish-brown colour; and if the iron it contains be separated by caustic potash, and the filtrate from the iron be acidified with acetic acid, a distinct yellow coloration is obtained with yellow prussiate of potash, thus showing that a small amount of vanadium is dis

solved. In experiment E, the substance was treated twice with potash and hydrochloric acid; this may account for the result being a little lower than D. It was also observed that if, on dissolving the pig in acid, the clear chloride of iron be poured off, and the insoluble portion boiled for a long time with strong hydrochloric acid, this second portion, on filtering, gave a filtrate which differed in colour from the bright green of protochloride of iron, and was tinged brown; this is most probably due to the solution of a little vanadium. As this pig (Westbury) contained so high a percentage of phosphorus, it was thought advisable to test the residue for phosphoric acid. A determination of this acid was made in residue E. The portion soluble in hydrochloric acid was mixed with chloride of ammonium, tartaric acid, ammonia, and chloride of magnesium, and the solution allowed to stand two days. The ammonia-phosphate separated, dried, ignited, and weighed gave of pyrophosphate of magnesia .265, corresponding to .17 PO_5 ; the filtrate from the ammonia-phosphate gave no indications of the presence of iron with yellow prussiate of potash, or with sulphide of ammonium.

The total residue 2.085 diminished by .17 PO_5 leaves 1.915; hence, assuming that the portion of this residue soluble in acids is vanadic acid, VO_3 , and that the black residue is suboxide VO , we find for the quantity of vanadic acid,

$$\begin{array}{rcccl} & & \text{VO.} & & \text{VO}_3. \\ 1.915 & - & 1.105 & = & .81 \end{array}$$

Consequently, the equivalent of vanadium being 68.6, the percentage of metal will be—

$$\begin{array}{rcccl} \text{VO.} & \text{V.} & \text{VO.} & \text{V.} & \\ 76.6 & : 68.6 & :: 1.105 & : .989 & \\ \text{VO}_3. & & \text{VO}_3. & & \\ 92.6 & : 68.6 & :: .81 & : .60 & \\ \text{Fig.} & \text{V.} & & \text{V.} & \\ 231.25 & : 1.589 & :: 100 & : .686 & \end{array} \quad \left. \vphantom{\begin{array}{rcccl} \text{VO.} & \text{V.} & \text{VO.} & \text{V.} \\ 76.6 & : 68.6 & :: 1.105 & : .989 \\ \text{VO}_3. & & \text{VO}_3. & & \\ 92.6 & : 68.6 & :: .81 & : .60 \end{array}} \right\} = 1.589$$

Two trials were made to endeavour to obtain vanadium from white pig; it was, however, found impossible to separate the iron completely. As in the case of the other pig, the residue obtained in the first experiment was treated similarly to the grey pig; in the second, the residue, after dissolving out the iron in dilute acid, was boiled with concentrated acid for some time, and, after filtering off the insoluble matter, was treated twice with potash and hydrochloric acid alternately, to see if the iron could not be dissolved out; it was, however, as is seen by the result, unsatisfactory; had it been possible to separate the vanadium from the white pig, it would have been far more advantageous, as the grey pig leaves a considerable amount of graphite, which requires much time to burn.

Two pounds of the pulverised pig were operated on with dilute sulphuric acid, the silica being dissolved with potash; the residue obtained by burning the graphite contains, however, some amount of iron. A little vanadic acid was prepared from this by treating the pulverised residue with ammonia, allowing it to stand some time, then gently warming it: the ammoniacal solution was of a deep red colour; this, when evaporated and allowed to stand, deposited a considerable amount of oxide of iron, and small distinct granular crystals attached themselves to the beaker. The solution filtered from oxide of iron was colourless; on evaporating it to dryness and heating it, the vanadic acid separated, first of a beautiful orange red colour, then green; and on heating more strongly, it assumed a dirty greyish-green colour. If the residue when free from iron is treated with ammonia, a beautiful yellow solution is obtained, which, if it has been heated, deposits,

on cooling, small granular crystals of vanadate of ammonia. The residue from the 2 lbs. of pig, after being treated with ammonia, was dissolved in hydrochloric acid, the liquid being boiled for many hours; it was then filtered from the greyish residue, and the solution evaporated, to expel the larger portion of free acid. It then deposited on the sides of the beaker a white, amorphous, light substance, which adhered strongly to the glass. This has not yet been examined; it appears to be insoluble in hydrochloric acid. Nitric acid was added to expel the hydrochloric, the larger portion of the free acid driven off, and the solution then treated with ammonia, which threw down an abundant precipitate of oxide of iron. The filtrate, however, contained only a trace of vanadic acid, the whole being precipitated by the ammonia with the iron.

The ore has not yet been tested for vanadium. The following is the analysis of the Seend ores, made by me some time since:—

	Seend Iron Ore.	Metallic Iron.
Silica	13.02	
Peroxide of iron	64.61	
Alumina	3.85	
Lime .. ..	.64	
Magnesia .. ..	.20	45.22
Phosphoric acid .. ..	.64	
Combined water	10.21	
Moisture	1.64	
	<hr/> 99.81	

An account of the analyses of the Westbury ore will be found in the Journal of the Society, vol. xv, page 334. Some remarks are made respecting the oxide of iron obtained, the weight of which could not be made to correspond with the results obtained by standard solution. Now that the vanadium has been found in the pig, it is most probable that some vanadic acid is contained in the oxide of iron; the author proposes, however, to re-examine the ore, and lay the result before the Society at some future time. This pig-iron will readily furnish any quantity of the hitherto somewhat rare metal vanadium, with tolerable facility. Vanadium is, however, now obtained as a waste product from bauxite, in the manufacture of aluminium, to what extent the author cannot say, or whether it would be a better source for the metal than the pig-iron.

This pig-iron appears to contain more vanadium than that made from the Taberg ore, in Sweden; and, so far as the author is aware, it affords the first instance in which this metal has been found in English pig-iron; some mention is made of its occurrence in a Staffordshire slag (Chem. Gaz. 1848, page 298), by Dick, but only a mere notice is given of it.

At the present time, a large quantity of the pig, about 17 lbs., is being dissolved in acid, and in a short time the author hopes to lay some further results before the Society, as to the state in which the vanadium occurs in the ore, and the influence it has upon the iron.

Extracts, Notes, and Memoranda.

AN IMPROVED SAFETY VALVE.—An improved safety valve has been patented by Mr. Charles Beyer, of the firm of Beyer, Peacock, and Company, Gorton Foundry, Manchester, the object of which is to remove the defect generally admitted to exist in the ordinary safety valve, of not lifting or

blowing off freely until the pressure has increased to considerably above that fixed on. This is effected by an arrangement which causes the new valve, when the pressure has become sufficient to overcome the weight upon it, to lift much higher than the ordinary safety valve, and thus give a larger opening for the escape of the steam. This arrangement consists in forming a flange round the valve, commencing at the outer edge of the facing, which flange is under-cut and concave in shape, with the concave side towards the valve seating, which has also a flange upon it commencing at the outer edge, but convex on the upper surface, corresponding nearly to the concave surface of the flange on the valve. There is a slight space between the concave and convex surfaces of the two flanges, which diminishes towards the outer edge. When the steam begins to escape from between the surfaces of the valve, it gets between the concave and convex surfaces of the two flanges, so that its force thus acts upon a larger area, re-acting upon the concave surface of the valve, and causing it to open to a greater extent than the ordinary valve.

DIRECT PRODUCTION OF WROUGHT IRON AND STEEL IN THE BLAST FURNACE BY THE INJECTION OF FINELY DIVIDED OXIDE OF IRON WITH THE BLAST.—Mr. J. H. Johnson, of Lincoln's Inn Fields, has patented an invention for improvements in the manufacture of wrought iron and steel, and in the apparatus to be employed therein, the object of which is to produce wrought iron and steel in a blast-furnace direct from the ore, by a process which consists essentially in injecting or blowing into the furnace finely divided oxide of iron with the blast. By this system the decarburation of the cast iron is accomplished in the blast-furnace itself, without the intervention of puddling or other furnaces, or the appliances hitherto required for the conversion of cast iron into wrought iron or steel. The oxide of iron may be replaced by any other oxide capable of producing the decarburation of cast iron, may be blown into the blast-furnace, and other substances may be similarly introduced for the purification or modification of the products. It will be necessary in carrying out this invention to make the crucible of the blast-furnace deeper than usual, and to adapt to it three tiers of twyers. The upper set of twyers operate in the usual manner; the second or central set serve the double purpose of blowing in the oxide or other substances introduced, and of injecting a blast into the furnace; whilst the object of the lowest set is to prevent the caking of the oxide or other substances injected by maintaining a highly elevated temperature in the region where these substances primarily enter the furnace. The sides of the crucible are protected by cast-iron jackets or wrought-iron pipes, through which a circulation of cold water takes place; and a hot blast is employed for all the twyers.—In order to regulate the supply or distribution of the finely divided oxide of iron or other substances injected, a double hopper is fitted to each of the blast pipes intended to inject such substances into the furnace; and a revolving plug (having chambers in its surface), or an archimedean screw, is fitted into the lower mouth of the lower hopper, just above the blast pipe. The lower and upper hoppers are divided by a valve, and there is a similar valve or cover fitted to the top of the upper one. To the lower valve is connected a rod or spindle passing through the upper valve or cover, and furnished with one or more arms by which the charge which is first introduced into the upper hopper is agitated so as to facilitate its descent into the lower one when the bottom valve is opened. In some cases a pipe may communicate from the blast pipe to the upper part of the lower hopper, so as to equalise the pressure in the hopper and blast pipe. The oxides or other substances to be injected are, by preference, heated to a dull red heat before entering the blast pipe.

SPHERICAL STEEL SHOT.—Referring to some recently reported experiments, showing the destructive effects of Bessemer spherical steel shot,

fired from a smooth-bored gun against 5½" armour-plate, Mr. Henry Bessemer wrote to the *Times* on January 16th, stating that as far back as three years ago he had obtained a patent for producing cast-steel spherical shot by a peculiar arrangement of the rolling mill, by means of which they were enabled to be made with rapidity and correctness, and further that he had exhibited a spherical steel cannon ball at the International Exhibition in 1862, for the purpose of giving additional publicity to his views on this important question. Notwithstanding this, however, he complains that he was unable to obtain any trial of their efficiency until quite recently, although such a trial might have been made at any time in ten or twelve days, with an expenditure of 50*l.*; while in the meantime many hundred thousand pounds had been expended in building iron-plated ships which these long-neglected steel projectiles will riddle as easily as the cast-iron shot found its way through the wooden walls of the old men-of-war. He considers it marvellous how the advantage of using such a material for projectiles did not force itself upon the attention of every practical artillerist, irrespective of any efforts on his part, and compares the manner in which a cast-iron shot is broken on striking an armour-plate with the scattering of a snowball thrown against a hard body. It appears to him that it should be obvious to every mechanical mind that when a cast-iron shot is shattered to atoms against an armour-plate, the force expended in the disintegration must be considerable; and it should be equally clear that the force so expended is not a new force created for that especial purpose, but part of the original force imparted to the shot, and must consequently be deducted from the available force to be expended on the armour-plate. After referring to the advantages of employing steel instead of iron in the building of ships, Mr. Bessemer concludes with the following statement:—"Thousands of Bessemer steel projectiles are now being made for Russia, and from undoubted sources I learn that other orders for steel shots have been given to the extent of 120,000*l.* in value. Have we a single ship afloat that can keep out these simple round steel shot fired from a common smooth-bored gun, if ever directed against us? This is a grave question, and demands a speedy answer."—In reference to the same subject, Messrs. Josiah Vavasour and Co., of Southwark, write that, quite irrespective of any efforts of Mr. Bessemer, they have been making by order of Capt. Blakeley, from steel supplied by Messrs. Naylor, Vickers and Co., and Messrs. Kenyon, of Sheffield, large quantities of spherical steel shot, principally for 9" and 11" guns, the shot weighing respectively 104 lb. and 198 lb.; some of which they have reason to believe were used by the Confederates in the first attack of the Monitors upon Charleston, in which action the Keokuk was so severely handled.

COATING THE SURFACE OF IRON WITH ALUMINIUM.—A patent has been granted to Mr. William Clark for a method of coating the surface of iron with metallic aluminium, either wholly or in part, which is effected in the following manner:—First, the surface of the iron to be coated is made perfectly clean, after which is taken 60 lbs. of any porcelain frit, composed in part of feldspar, silice, and china clay, to which is added 10 lbs. of feldspar, and not less than 20 lbs. nor more than 40 lbs. of dry white lead. The whole of these are mixed together, and sufficient pure water added to bring them to the consistency of ordinary cream, after which they are put into a common porcelain or frit mill and ground until a complete incorporation is produced. Next not less than 10 nor more than 15 parts by weight of this mixture is taken; and to it is added not less than 1 nor more than 10 parts of any of the so-called fat alum and potash clays, after having first calcined and pulverised the clay, and added sufficient water to make it of the same consistency as the mixture of frit feldspar and white lead. Next sufficient water is added to the whole compound to reduce it

to such a consistency as will just permit it to adhere to and cover the whole surface of the iron either when the latter is dipped into the compound or when the compound is poured on it. When the iron has in this manner received a thin covering, and been thoroughly dried, it is placed in a reverberatory furnace or oven and baked until the surface presents a glazed appearance. When it is removed from the furnace the iron will be found to be covered with a hard vitreous coating—adhesive, elastic, and tough enough to resist any bending of the iron at less than a right angle, and also indestructible by the ordinary acids or alkalis. This elasticity and adhesiveness is presumed to be due to the fact that the compound in the baking process yields metallic aluminium, which lies between the iron and the outer glaze, firmly adhering to both. A frit may be formed of the following materials and proportions by weight :—Feldspar, 50 parts; flint or silex, 30 parts; China clay or kaolin, 10 parts; sal soda, 25 parts; Spanish white, 20 parts; boracic acid, 10 parts.—To coat iron with aluminium alone, take from 2 to 3 parts by weight of any of the fat alum or potash clays prepared by calcination and pulverisation as before described, and add from 1 to 2 parts of boracic acid. When the whole is reduced to a consistency of cream, dip the iron into the paste, and dry it until all the moisture is expelled; then bake until the surface appears glossy and the paste is reduced (as it is termed) by the heat, when the iron is removed from the furnace, care being taken not to allow anything to come in contact with the paste in its soft state. As the iron shrinks by cooling, the slag will throw itself off by decrepitation, leaving the iron covered with metallic aluminium. Then, if for use under salt water, coat the surface with common coal oil or kerosene, which, besides increasing the resistance to corrosion, also repels the attacks of animalcules and molluscs, from its offensive odour.

GEOLOGICAL SOCIETY OF DUBLIN.—A general meeting of this society was held on Jan. 13th, Professor Jukes in the chair. The two papers read were "An Attempt to Calculate the Duration of Time involved in Geological Epochs," by Professor Haughton; and one on the discovery of the bones of the polar bear in Lough Gur, by Dr. Carte.

CHABASITE IN GRANITE.—At the recent meeting of the Lower Rhenish Natural and Physical Society at Bonn, a communication was read from Herr F. Ulrich, of Oker, near Goslar, in which he stated that chabasite had been found in the cavities of the granite of Oker-Thal, where he had before discovered calc-spar. This discovery is very interesting, as chabasite had never hitherto been found in granite. At present, however, there is a second locality where this zeolite has been met with in granite, having been discovered by Professor G. Rose, in cavities in that rock, in Connecticut.

UNPROTECTED MINE SHAFTS.—A melancholy accident occurred at Creegbrawse, near Challwater, Cornwall, on the night of January 8th, to a young woman, named Mary Ann Bawden, who was killed by falling down an old unused mine shaft, 80 fms. deep, situated on the property of Lord Falmouth. It is stated that in this immediate neighbourhood there are numerous such shafts lying open near the roads and paths, and that similar accidents are of frequent occurrence in the locality. This accident seems to have excited considerable public attention, if we may judge by the number of communications that have appeared in the *Times* and other papers on this subject. The Marquis Townshend has written to express a hope "that in the next session of Parliament an act will be passed imperatively to force upon those persons to whom such shafts belong a duty which the dictates of humanity fail to induce them to perform, and that in the meantime this recent and very sad calamity will cause some temporary measures of safety being adopted without delay." As the Marquis is the father-in-law of Mr. John St. Aubyn, M.P. for the Western Division of

Cornwall, it is possible that we may expect some attempt at legislation on the subject in the coming session of Parliament. It is not probable, however, that the matter will be finally dealt with until the whole subject of the legislative regulation of metallic mines comes before Parliament on the report of Lord Kinnaird's Royal Commission.

MECHANICAL PUDDLING.—A patent has been granted to Mr. Henry Bennett, ironmaster, of Wombridge Ironworks, Salop, for an improved apparatus for facilitating the puddling of iron, the object of which is to apply mechanism, worked by steam or any other motive power, to assist the workman in the process of puddling. This is effected by means of a shaft working horizontally endways, or backwards and forwards like the piston-rod of an engine. This shaft can be extended to serve several furnaces, and to it is attached a connecting rod moving a sliding piece backwards and forwards in a slide, connected with which sliding piece there is a vertical shaft, at the top of which the puddler's rabble or tool should rest so as to participate in the motion of the vertical shaft; which shaft can be moved round to different angles by means of a ratchet motion, so that the puddler can guide the rabble to different parts of the furnace. By means of this invention a puddler will be enabled to work with ease a larger quantity of iron in each charge, thus effecting a saving of fuel, time, and labour, to change his tool as readily as before, and still to work in the ordinary way independent of the apparatus at any moment by disconnecting it. A larger furnace may also be used, and several rabbles worked at the same time, if thought desirable.

COKE OVENS IN CONNECTION WITH GAS-MAKING.—A patent has been granted to Mr. George Stevens, of Camberwell, for improvements in coke ovens in connection with retorts for generating coal-gas, the object of which is to economise fuel by making gas at the same time that hard coke is manufactured. This is effected by building a coke oven below and an oven or retort for generating coal gas above, and in heating the latter with the surplus heats from the coke oven. The coke oven is built with a floor laid dry in brick on edge upon a thin layer of rubble or coarse gravel, spread over a solid brick foundation, the sides being upright, upon which an arch is turned. Holes or perforations are made in this arch to allow the surplus heats to pass from the coke oven below into flues built round the gas oven or retort above. A double or revealed arch is turned over the mouth of the coke oven, at the bottom of which an iron plate is laid to protect the brickwork and form the sill. The coke oven is curved at the back, as well as on each side near the front, and is slightly curved on the top, while the entrance is splayed, and the angles at the junctions of the sides built in fire-stone, with skew backs at the top, to receive the minor arch turned over the mouth. The gas retort is built over the coke oven with a flat tile bottom, upright sides, and arched top; or the arch may spring from the floor without sides. Flues connected with the perforations in the arched top of the coke oven are built on the sides and top of the gas oven, traversing backwards and forwards, and alternately passing to the front and back ends of the latter, and ultimately into the main chimney. The front end of the gas oven has an iron plate with a mouth-piece and door, and a socket attached, to receive the pipes that convey away the gas in the ordinary manner; and sight-holes are made in front to give a view into the several flues. In order to assist the combustion of the unconsumed gases arising in the early stages of each charge of the coke oven, a flue is formed for the purpose of admitting atmospheric air in small quantities through perforations into the flues surrounding the oven or retort, and at the entrance of this air flue a ventilator is fixed to regulate the supply. All the brickwork and tiles exposed to the fire are of fire-clay, as well as the front brickwork under the mouth of the coke oven.

APPLYING A JET OF SUPERHEATED STEAM TO REVERBERATORY FURNACES.—A patent has been granted to M. J. B. P. A. Thierry, of Paris, for certain improvements in the construction of furnaces which render the combustion of the fuel more complete, and prevent the emission of smoke. This is effected by blowing in from the front of the fire-place against the bridge of the furnace one or more jets of superheated dried steam, freed of its hydrogen by intense heat, which feeds the fire with a gaseous compound of carbonic acid and oxygen, and thus so intensifies the combustion as to avoid the formation of smoke. The temperature of the steam should be from 300° to 600° C. (570° to 1,100° Fahr.), and can be applied in various ways, according to circumstances. Atmospheric air may also sometimes be blown in combination with the steam, which is best effected by placing an open pipe at the side of the steam jet, by which the air is drawn in in combination with the steam. The superheated steam may be prepared either by means of a worm placed in the fire-place of the furnace, or by a distinct apparatus, to which it is conveyed by a pipe, and from which superheating apparatus it is delivered to the blowing pipe, which are all provided with the necessary cocks and exhaust tubes. The pipes can be made of any suitable substance; but when of wrought or cast-iron, they must be protected against the action of the fire by a coating of platinum, fire-clay, porcelain, or other highly refractory material. When applied to reverberatory or puddling furnaces, a combined blast of air and steam is employed in the following manner:—A large pipe of fire-clay, iron, or other suitable material is lodged in the masonry of the furnace, the outer end of which receives the blow-pipe from the superheating apparatus, together with another open pipe, capable, however, of being closed at its outer end. This latter pipe, when open, admits of the atmospheric air being drawn into the furnace with the draft occasioned by the jet of steam.

The president of the Board of Trade has appointed Dr. Robert Angus Smith, F.R.S., F.C.S., to be the Inspector of Alkali Works, in conformity with the provisions of the 26th and 27th Victoria, cap. 124.

Dr. F. Knapp's translation of the published volume of Dr. Percy's *Metallurgy* is now completed—the 2nd part having been recently published by Vieweg and Son, Brunswick.

In consequence of the death of Herr Thierbach, the well-known publisher of Freiberg, the *Berg- und Hüttenmännische Zeitung* is now published by his successor, Arthur Felix. A change has also occurred in the editorship by the retirement of Herr Bornemann, who desires to devote his entire attention to the *Civilingenieur*, of which he is the sole editor. He is succeeded by Herr Friedrich Wimmer, of the Royal Clausthal Mining School, who will henceforth be associated with Herr Bruno Kerl in the editorship of the *Berg- und Hütten. Zeit.*

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SMYTH, Prof.—Lectures on Mining at the Royal School of Mines:—1. Education of Miners.—2. Iron Ore Deposits.—3. Reopening of Old Mines.—4. Precautions when Searching for Minerals.—5. Sinking Bore Holes.—6. Apparatus used in Boring. (Coll. Guardian, Dec. 19 to Jan. 23.)

TURLEY, B.—Abweichung der Compagnadel an einer Schnur durch den Einfluss magnetischer Gesteine. (Berg- und Hütten. Zeit., Nr. 1, 1864.)

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Patents relating to Mining and Metallurgy.

(Compiled from Commissioners of Patents' Journal.—Subject matter only given.)

UNITED KINGDOM.

APPLICATION FOR PATENTS FROM DEC. 24TH TO JAN. 21ST.

3265 (1863). W. H. BOWDITCH, Improvements in supplying air to lights in mines.

3273 (1863). J. GJERS, Kilns for calcining ironstone and limestone.

3296 (1863). EARL OF DUNDONALD, Production of hydro-carbon, from tar, coal, and other bituminous substances.

16 (1864). W. BALK, Furnaces for smelting ores, and melting metals.

30 (1864). J. J. HAYS, Manufacture of charcoal.

31 (1864). J. WILLIAMS and G. BEDSON, Improvements in puddling furnaces.

58 (1864). B. SAMUELSON, Improvements in smelting iron ores.

90 (1864). C. BARTHOLOMEW, Improvements in working coal.

100 (1864). W. DENTON and J. WHITAKER, Apparatus for preventing accidents in mines and collieries, by the breaking of ropes or over-winding.

158 (1864). G. F. DONISTHORPE, Machinery used in getting coal, stone, and other minerals.

160 (1864). N. J. LE CRUN, Safety apparatus for arresting the fall of cages in mine shafts, should their suspending chain break.

163 (1864). E. T. JARROLD, Improvements in deodorising petroleum and other hydro-carbon oils.

PATENTS SEALED FROM DEC. 29TH TO JAN. 12TH.

1888 (1863). W. and S. FIETH, Machinery for working coal and other mines.

1981 (1863). J. G. WILLANS, Manufacture of iron.

2525 (1863). P. LESLEY (com. from T. S. BLAIR), Manufacture of rails for railways.

1704 (1863). J. THOMAS, Improvements in treating ores and earths containing iron, in order to obtain the metal therefrom.

1728 (1863). W. HENDERSON, Treating ores and substances containing iron in the manufacture of iron, steel, and alloys of iron; also in the construction of retorts for treating the same.

1763 (1863). E. SONSTADT, Manufacture of sodium.

1872 (1863). A. A. A. DE ROSTAING, Method of manufacturing iron and steel with cast-iron in a sub-divided state.

2671 (1863). G. E. DONISTHORPE, Apparatus for getting coal and other minerals.

PATENTS ON WHICH £50 DUTY HAS BEEN PAID, FROM DEC. 31ST TO JAN. 19TH.

20 (1861). T. COBLEY, Manufacture of commercial salts directly from the ores of lead.

163 (1861). R. MUSHET, Manufacture of cast-steel.

213 (1861). R. MUSHET, Manufacture of melting pots or crucibles.

330 (1861). J. L. JULLION, Treatment of soda wastes and sulphurets.

PATENTS ON WHICH £100 DUTY HAS BEEN PAID, FROM DEC. 28TH TO JAN. 21ST.

284 (1857). J. OWEN, Machinery for the prevention of accidents in ascending and descending mine shafts.

167 (1857). T. JOHNSTON, Purifying alkaline lees.

221 (1857). H. BESSEMER, Manufacture of iron and steel.

PATENTS VOID BY NON-PAYMENT OF DUTY, FROM DEC. 19TH TO JAN. 9TH.

3136 (1860). D. A. MORRIS, Manufacture of sheet iron.

3161 (1860). F. PULS, Improvements in obtaining products from coal, and other bituminous substances.

3087 (1856). H. VAUGHAN, Method of hardening and tempering steel, and of hardening wrought and cast-iron.

36 (1861). W. M. WILLIAMS, Improvements in treating coal and other bituminous substances for the purpose of obtaining solid and liquid hydro-carbon.

AUSTRIA.

PATENTS GRANTED, PROLONGED, AND BECOME VOID DURING OCTOBER.

474. J. BEST, Treatment of mineral oils and liquid carburets. [Granted.]

483. J. M. GERSTENHÖFER, Furnace for roasting pure pyrites of sulphur. [Granted.]

485. J. BEST, Apparatus for distilling liquid carburetted hydrogen in general and mineral oils. [Granted.]

381. A. L. S. CHENOT, Processes for reducing oxides of metals. [Prolonged.]

397. J. A. VON SONNENTHAL, Manufacture of malleable cast steel from pig-iron, old iron, and its waste, by means of peculiar crucibles and moveable smelting furnaces. [Prolonged.]

462. M. J. VON SCHICK, A fast rock-borer. [Become void.]

472. J. KÖRÖSI, Utilising chips of wrought, cast, and other kinds of iron, for the manufacture of cast-steel. [Become void.]

488. E. SCHMIDT, Apparatus for the manufacture of tin plates. [Become void.]

BAVARIA.

PATENT DELIVERED ON NOV. 20TH.

80. DR. L. GIULINI, Manufacture of carbonate of baryta and natron.

BELGIUM.

PATENTS DELIVERED DEC. 31ST.

- 15,388. J. STURGEON, Machine for boring rocks and cutting coal.
 15,394. W. FIETH and J. STURGEON, Machines for cutting and boring coal.
 15,419. M. EVRARD, Preparing ores.
 15,442. W. H. DAWES, Manufacture of iron.
 15,471. J. GRIFFITHS, Machine for puddling iron and steel.
 15,490. R. MUSHET, Manufacture of iron and steel.
 15,491. R. MUSHET, Manufacture of iron and steel.
 15,498. P. ESCALLE, Charging blast-furnaces.
 15,525. E. HAKZE, An electric telegraph for mines.
 15,527. A. V. BRULE, Manufacture of chlorine by bichlorides.
 15,530. F. A. DE TREGOMAIN, Conglomerating coal.
 15,536. BLONDIAUX and Co., A puddling furnace.

FRANCE.

CURRENT LIST OF PATENTS.

- 59,641. FELIX, Continuous mode of distilling and purifying mineral oils.
 59,643. GALY-CAZALAT, Improvements in converting pig-iron into cast-steel, malleable cast-iron, and fine iron.
 59,673. DUPRES, Means of preserving metals from oxidation.
 59,679. LECLERC, Treatment of copper ores, except grey, by the dry process.
 59,724. COLSON, Apparatus for extracting coals, ores, and other substances from mines, and for raising and lowering workmen alternately or simultaneously.
 59,766. LANGENARD, Process for smelting zinc, tin, lead, and other metals.
 59,913. FLEURY, Manufacture of iron and steel.
 59,938. WILSON, Construction of blast-furnaces and cupolas in metallurgic works.

UNITED STATES.

PATENTS ISSUED FROM DEC. 8TH TO JAN. 12TH.

- 40,874. Z. WHEELER, Machine for amalgamating gold and silver.
 40,894. J. B. ATWATER, Apparatus for amalgamating precious metals.
 40,950. P. SCHEUVERMAN, Improved apparatus for washing ores.
 41,208. J. DECBE, Moulds for casting steel.
 41,250. J. D. WHELPLEY and J. STOREE, Improvement in burning, roasting, and smelting ores.

SPECIFICATIONS PUBLISHED, AND PRICES.

FROM DEC. 19TH TO JAN. 23RD.

* * * Specifications will be forwarded by post on receipt of price and postage at Her Majesty's Patent Office, 25, Southampton Buildings, London, W.C.—The amount of postage may be estimated from the price, as follows:—Where price does not exceed 1s. 6d., postage will be 1d.; above 1s. 6d., and not exceeding 3s. 4d., it will be 2d.; above 3s. 4d., and not exceeding 6s. 4d., it will be 4d.—Sums exceeding 6s. must be remitted by P. O. O., on Holborn Office, payable to *Bennet Woodcroft*.

- 972 (1863). C. W. and F. SIEMENS, Furnaces for smelting iron; 1s.
 973 (1863). W. S. MACDONALD, Drying mineral substances; 4d.
 1,008 (1863). J. WHITLEY, J. B. POPE, and J. W. BURTON, Manufacture of iron, copp.r., &c.; 4d.
 1,012 (1863). T. RICHARDSON and J. C. STEVENSON, Manufacture of sulphate of soda; 4d.

- 1,059 (1863). S. INGLEDEW, Obtaining iron from its ore; 4*d*.
 1,072 (1863). G. E. DONISTHORPE, Carriage for working coal picks; 1*s*. 2*d*.
 1,089 (1863). W. CLARK (com. from L. J. F. MARGUERITTE), Manufacture of hydro-cyanite of ammonia; 4*d*.
 1,113 (1863). B. G. SLOPER, Separating metals from earthy and other matters; 8*d*.
 1,140 (1863). P. BOURNE, Miners' lamps; 4*d*.
 1,205 (1863). K. L. HEUSNER, Manufacture of hydrate of barytes; 4*d*.
 1,209 (1863). R. A. BROOMAN (com. from F. A. T. DE BEAUEGGARD), Extracting hydro-carburets; 8*d*.
 1,238 (1863). E. B. WILSON, Manufacture of iron; 10*d*.
 1,242 (1863). H. BENNETT, Puddling iron; 1*s*. 10*d*.
 1,278 (1863). E. SONSTADT, Manufacturing and purifying magnesium; 8*d*.
 1,322 (1863). J. MUNRO and R. SCOTT, Apparatus for boring and mining; 1*s*. 4*d*.
 1,350 (1863). W. LORDER, Rails for railways; 10*d*.

Current Review of Mining, Quarrying, and Metallurgy.

CORNWALL, DEVON, AND WEST SOMERSET.

THE extraordinary rise in the copper standard, which has advanced upwards of 12*l*. in three sales, may be expected to give quite a new impetus to Cornish mining—the large producing mines of that county being now so wholly dependent for profit on the price they realise for their ores. If the standard should continue to advance—which seems to be the opinion of those best conversant with the trade—we may look for a greatly increased developement of copper mining in Cornwall by the reworking of many old mines. Compared with the other metals, tin till quite recently has been dull; but during the last month an advance of 6*l*. has been made in the standards.

The petition for winding up *Silver Vein* mining company, referred to in our last, was dismissed by the Vice-Warden at the hearing on Jan. 4th, with costs against the petitioner, Mr. J. H. Dingle, of Lostwithiel.

Prosper United continues to look well. Moor lode, lately intersected in the 70, has been cut through and found to be 4½' wide, worth 5 tons of copper ore per fathom. At Louisa's engine-shaft the main bob parted on January 24th, and the mine has filled with water to the 40. At *East Providence* the 70 east from Boorman's shaft is reported to be in a good lode for tin. The stopes and pitches throughout the mine are yielding fair quality tin stuff. At *Great Wheal Fortune*, the 102 west of Painter's, is reported to be looking well. An important improvement has taken place on the blue lode, at *New Wendron*, where a fair course of tin has been met with. *New Rosewarne* is still falling back, the bottom, ends, and flat-rod shaft being very poor.

The sampling at *Wheal Seton* last month was the largest for many years. The sump winze, however, is still falling off, the horse of killas going larger, but at other points the mine is looking well. *Wheal Uny* is looking much better in the tin part of the mine, and if the quality of the work should become more valuable, a good mine may be expected. An improvement is reported at *Crane*, in the 30 west. At *North Roskear* the new steam-stamps, steam-whim, skip-shaft, railroads, &c., are advancing

towards completion; when this is done calls will end, and good and regular returns of tin may be expected. At *North Crofty* the lode in the 170 east is reported to have improved to 35*l.* per fm. *Nanjiles* appears to opening out well. The lode in the engine-shaft is reported to be worth 80*l.* per fm. *East Carn Brea*, which has been abandoned by the brokers for the Chivertons, is reported to have improved in the 60 west, where the lode now yields 6 tons per fm. At *Great Wheal Busy* there is a good course of ore in the 130 east. A great sensation has been excited at Truro by the report of hot water having been cut at *South Seton*, and it is gratifying to remark that the enthusiasm of the shareholders seems to be as warm as the water. It is sincerely to be hoped that this hot water will turn out to lead to something more substantial for the sake of the purser, Mr. Tippet, who has been the means of having this ground tried with such patience and perseverance during long years of ill success. At *Cook's Kitchen* prospects have considerably improved during the last few months, and the engine-shaft, formerly worth 20*l.* per fm., has now improved to 70*l.* At *Great North Downs* ore has been struck in the engine-shaft, but, being at the bottom of mine and under water, its value cannot be ascertained. Mr. J. Y. Watson, in the city article of the *Mining Journal*, says that in *Wheal Grenville* the points of present operation are in the aggregate worth nearly 140*l.* per fm.

At *West Chiverton* the rise in the back of the 70-fm. level, on Elizabeth lode, is up 6 fms. in a good course of lead. At *East Chiverton* the lode in the 35, west of south cross-cut, is said to be 3½' wide, with a promising appearance. Very glowing reports are also published of almost all the mines in the district, whose name is now legion.

At *Marke Valley* there is an improvement in the 90 west, which yields 2½ tons of ore per fathom. *Cornubia*, as usual, is reported to be still improving. At *East Russell* the lode in the 120 has fallen off, and other points in the mine are reported to be looking less promising at present.

At *Clifford Amalgamated* meeting (on Dec. 23rd) it was resolved that no transfer of shares be received for registration unless accompanied by 1*s.* as a registration fee, and that the amount so received be credited to the adventurers.

At *Camborne Veau* meeting (on Jan. 15th) it was resolved to erect a new 26' cylinder steam stamps. At *Wheal Butler* meeting (on Jan. 12th) it was resolved that Davey's shaft be sunk, the 132 and 145 driven east from Whitford's shaft, and the 117 east of Davey's shaft, with all possible despatch. At *Trevenen and Tremenheere*, Mr. J. J. Rogers, M.P., has reduced the dues to one-twenty-fourth during pleasure, to commence from date of accident which occurred ten months ago.

The following are the new undertakings announced during the month. The *Pennance Consols* Silver-Lead and Copper Mining Company, with a capital of 12,500*l.*, in shares of 1*l.* each, to work the Pennance Consols Mine, near Falmouth, held for 21 years, at 1-15th dues, and a rental of 25*l.* for the use of water. A purchase-money of 6,500*l.* is to be paid to the vendor, Mr. Joshua Fox, in paid-up shares of the company. It is stated that Mr. Fox has already done over 6,000*l.* worth of work in bringing in adit, sinking shafts, and other works. This sett adjoins the old Swanpool mine, abandoned three or four years ago, and at one time was purchased by Messrs. Phillips and Darlington, with the intention of being worked in connection with Swanpool. The *West Dolcoath* Copper Mining Company (Limited), with a capital of 18,000*l.*, in 6,000 shares of 3*l.* each, formed for the purpose of working a piece of ground in the parish of Gwinear, under the secretaryship of Mr. Thomas Spargo, with Sir John Louis, Bart., for one of the directors. The *Rosecliff* Silver-Lead Mine, St. Columb, on the cost-book system, divided into 5,000 shares. This mine is started by the same party as started Chiverton Wheal Rose. *Polbreen and Charlotte United*,

in the parish of St. Agnes, divided into 100 shares of 25*l.* each, under the secretaryship of Mr. Thomas Shargo. The *New Combmartin Silver Lead Mining Company*, with a capital of 16,000*l.*, in 8,000 shares of 2*l.* each, for working a piece of ground adjacent to the Old Combmartin mine, near Ilfracombe, North Devon.

WALES AND THE BORDERS.

SOUTH WALES.—The iron trade has not been quite so brisk as it was last month, but still a very considerable amount of business has been transacted. A good demand for home consumption seems to have set in, and as the American and Continental markets are large consumers, the various works are well supplied with orders, which will require some time to execute. There does not appear to be any great anxiety on the part of makers to accept orders at the slightest decline upon present prices, the general impression being that as the season progresses another advance will be reasonably demanded and readily obtained.

Several large works in the South Wales district have recently changed hands, whilst others which have remained idle will be in active operation again in the course of a few weeks. The *Fynscedwyn Iron Works*, in the Swansea Valley, which once employed hundreds of workmen, and turned out some of the best iron in the whole district, have suspended operations for a considerable length of time, although the coal and mine on the property have been worked for several months past by contractors for the *Ystalyfera Iron Company*. It is reported, however, that these contractors have received a month's notice to suspend operations, and it is considered likely that operations upon a more extensive scale will be shortly commenced, and the whole works are expected to be again in active operation by June next.—In the Aberdare Valley the *Hirwain Works* will also shortly start again, and thus there seems every probability of continued prosperity for the iron trade in the South Wales district.

The *Penydarren Iron Works*, Merthyr, which have been closed for upwards of five years, were reopened on the 19th, when great excitement was manifested, all the shops and principal houses of business being closed, and some of the buildings illuminated.

The following is a return of the furnaces in blast and out of blast at the Monmouthshire and South Wales works on Jan. 1, 1864. Those marked with an asterisk (*) are about to commence operations:—

Name of Works.	Proprietors.	In.	Out.	Total.
Aberamman	Crawshay Bailey	3	—	3
Abernant and Llwydcoed	Abernant Iron Company	7	—	7
Ditto, Glyn Neath	—	—	2	2
Abersychan	Ebbw Vale Company	4	2	6
Beaufort	J. and C. Bailey	6	1	7
Blaenavon	Blaenavon Iron Company	6	—	6
Brynnna*	—	—	1	1
Briton Ferry	Townshend, Wood and Co.	2	—	2
Blaina	Levick and Simpson	2	—	2
Cwmcellyn	ditto	—	2	2
Coalbrookvale	ditto	2	—	2
Cwmavon	Gov. & Co. of Copper Miners	5	2	7
Cyfarthfa and Ynysfach	W. Crawshay	11	—	11
Cwmbran	R. S. Roper and Co.	2	—	2
Cefnewsk	—	—	4	4
Cwmnamman	—	—	2	2

Name of Work.	Proprietors.	In.	Cut.	Total.
Dowlais	Dowlais Iron Company ..	14	4	18
Ebbw Vale	Ebbw Vale Company.. ..	2	2	4
Golynos	G. E. Bevan and Co... ..	1	2	3
Gadlys	Wayne and Co.	4	—	4
Hirwain*	Hinde and Co.	—	3	3
Llynvi	Llynvi Vale Iron Company ..	4	—	4
Maesteg	ditto	—	3	3
Nant-y-Glo	J. and C. Bailey	7	—	7
Oullwyn	Hinde and Co.	1	1	2
Pentwyn	Ebbw Vale Company	—	1	1
Pentyrch.. ..	Booker and Co.	2	—	2
Pontypool	Pontypool Iron Company ..	4	—	4
Pont-ar-dawe	J. Lewis and Sons	1	—	1
Plymouth	Fothergill and Co.	10	1	11
Penydarren*	—	—	7	7
Rhymney	Rhymney Iron Company ..	7	2	9
Sirhowy	Ebbw Vale Company.. ..	3	2	5
Saundersfoot	—	—	4	4
Tondu	J. Brogden and Son	2	—	2
Trimsaran	—	—	2	2
Tredegar	Tredegar Iron Company ..	8	1	9
Treforest	F. Crayshay	—	3	3
Varteg	Partridge and Jones	1	1	2
Venallt	—	—	2	2
Victoria	Ebbw Vale Company.. ..	2	2	4
Ynyscedwyn	—	—	4	4
Ystalyfera	Budd and Co... ..	—	—	—

The coal trade has been very active, more so than has been the case for some years. The *Tredegar* Coal Company intend to largely increase their shipments, and Mr. Rhodes, proprietor of the *Risca* Colliery, who has received the Royal Mail contract for the present year, is also preparing for an extensive trade.

The colliers employed at the *Blaina* Collieries, the property of Messrs. Levick and Simpson, have turned out in consequence of alleged unfairness in weighing the coal. The men were offered the facility of employing a man to check the weight, but this they declined, and refused to return to their work unless the machine-man was discharged. Messrs. Levick and Simpson declined to accede to this demand, and brought several of the colliers before the magistrates for leaving their work without notice. There is as yet no sign of an amicable arrangement, and as Messrs. Levick and Simpson have extensive iron-works, requiring a daily supply of coal, the conduct of the men has occasioned a serious loss to them.

An explosion took place on December 26th at the *Gin* Coal-pit, *Maesteg*, the property of the *Llynvi* Vale Iron Company, when fourteen persons lost their lives by fire-damp, although little damage was done to the colliery.

In the month of December 140 vessels, with an aggregate registered tonnage of 11,036 tons, were engaged in the trade of Neath and Briton Ferry, against 139 vessels and 11,131 tons register in the corresponding month of 1862. The exports during the month were 15,066 tons coal, coke, and culm, 867 tons bar iron, 263 tons tin plates, 76 tons copper—making a total of 16,272 tons, being an *increase* of 792 tons as compared with December, 1863. 3,267 tons copper ore, 1,007 tons iron ore, 690 tons pig-iron were imported—making a total of 4,964 tons, against 5,830 tons

in the corresponding month. At Swansea, the shipping rates received during the month amounted to 1,376*l.*, being 106*l.* less than in December, 1862, and the tonnage of the vessels trading with the port showed a *decrease* of 3,427 tons. Adverse weather, the difficulty of obtaining sufficient coal from the collieries, and other circumstances were the causes of the slight falling off in the trade during the month of December.

During the year 1863 the total number of vessels engaged in the trade of Swansea reached 5,513, with an aggregate registered tonnage of 648,966 tons, and the shipping rates received amounted to 16,149*l.* 18*s.* 10*d.* As compared with the year 1862, the returns show a slight *decrease* in the number of ships trading with the port, and also in the tonnage; but there has been an *increase* of nearly 400*l.* in the shipping rates received, which is accounted for from the fact that a larger class of vessels has visited the port of late. 3,110 vessels, with an aggregate registered tonnage of 253,183 tons, were engaged in the trade of Llanelly, Carmarthen, Ferryside, Pembrey, and Penclawdd during the year, against 3,486 vessels, with a registered tonnage of 262,122 tons in 1862. The depressed state of trade during the first six months of 1863 was to a great extent the cause of the falling off in the number of ships and the tonnage.

The arrivals into Swansea during the past month include:—copper ore from Havre; cargoes of iron ore from Cherbourg; copper regulus from Caldera, Coquimbo, and Cuba; and copper ore from Coquimbo and Cuba.

The returns of the bill of entry at Cardiff for December show that 26,500 tons of coal were exported, being 10,000 tons less than the previous month, and 20,000 tons less than in the month of October; 6,720 tons of iron were exported, showing a slight *increase* as compared with the corresponding month of 1862. The cause of the falling off in the coal shipments has been the inefficient supply from the collieries. Large sums have in consequence been paid for demurrage. The importation of miscellaneous goods is slightly on the increase, and the trade of the port upon the whole is in a satisfactory state.

GLoucestershire.—The recent improvement of the iron trade has given considerable impetus to mining enterprise in the Forest of Dean, the iron ores of the district being in much request in South Wales. The trade is suffering at present from a great want of thorough communication, but the Worcester, Dean Forest, and Monmouth Railway is expected to be commenced shortly, and a large mineral traffic is anticipated. A further scheme is also on foot to connect the Central Forest Railway with the narrow gauge lines at or near Mitcheldean. Among the iron mining undertakings in course of opening may be mentioned the *Tufthorn* Iron Mine, belonging to the Royal Forest of Dean Mining Company Limited, who have just sunk to the ore, near Coleford, and the *Park Hill* Iron Mine, belonging to the Park Hill Mining Company Limited, whose deep adit, likely to be soon completed, will drain and open a large tract of maiden ground near Breem. The other iron mines of the district are chiefly in private hands.

The coal trade here has likewise improved, but is in fewer hands than formerly, several of the smaller and shallower works having been exhausted, but no scarcity of employment is felt.

The imports into Bristol comprise:—100 tons of lead ore from Plymouth, and 64 tons from Newquay; 140 tons of sulphur ore from Sines, and 430 tons from Pomaron; 1,362 bars of iron from Gothenburg; 20 tons of pig-iron from Glasgow and Belfast; 130 tons of copper slag from Glasgow, and 50 tons from Newcastle; 35 barrels of sulphur from Liverpool; and iron from Rotterdam. During December, 687 tons of coal, and 1,507 tons of iron were exported oversea from Bristol, against 316 tons of coal, and 459 tons of iron in the month of November, showing an *increase* of 371 tons of coal, and 1,048 tons of iron. The Customs' duties

received amounted to 58,164*l.* 18*s.* 8*d.* 51 British and 27 foreign vessels entered the port with a tonnage of 22,398 tons, and 13 British and 4 foreign vessels, of 4,957 tons, cleared outwards with cargoes. The returns for the past year give a total of 8,057 tons of coal, and 20,748 tons of iron exported from Bristol, showing a decrease of 4,377 tons of coal, but an increase of 6,609 tons of iron, when compared with the shipments of 1862.

The imports into Gloucester include :—180 tons of coal from Saundersfoot ; and 120 tons of pig-iron from Troon. Among the exports were :—321 tons of coal, and 649 tons of iron.

MIDLAND COUNTIES, SOUTH LANCASHIRE, AND SOUTH YORKSHIRE.

STAFFORDSHIRE AND WARWICKSHIRE.—Trade in this district has been very brisk during the past month, and all kinds of iron have had a great demand. The large works in the neighbourhood of Dudley, and in the direction of Kingswinford, Brettell-lane, and Brierly-hill, are all in full operation, the only drawback being on account of the scarcity of labour in some departments. There has been also a feeling of disquietude among a section of the men on the subject of wages.

The quarterly meetings of the *Staffordshire* ironmasters have been held during the month. The meeting of the North Staffordshire Coal and Ironmasters' Association was held at *Stoke-on-Trent*, on the 7th. The condition and prospects of the iron trade were spoken of on all hands as being good. The demand for plates, angle iron, and general merchant bars continued unabated, and buyers were willing to give out contracts for future delivery at quite 1*l.* per ton advance upon last quarter's prices. There was a good demand for pig-iron, and the prices had advanced in about the same proportion as finished iron, the best all-mine forge pig being quoted at 4*l.* 5*s.*, but makers declined to keep offers open beyond the next day. The coal trade was active, and had advanced in price from 8*d.* to 1*s.* 8*d.* per ton. The trade in ironstone was reported to be prosperous. An advance in miners' wages of 6*d.* a-day had been made.

At the *Wolverhampton* meeting, on the 13th, the attendance was good, but the amount of business transacted was moderate, partly from a disposition to postpone entering into any engagements until the Birmingham meeting, but more, perhaps, from the fact of there having been a larger quantity of iron sold prior to this quarter-day than has been the case for several years. This will account for the indisposition manifested by the ironmasters as to obtaining further orders ; indeed, some of them have sold almost as much as they can produce during the quarter, making allowance for such casual orders as may hereafter come in from regular customers, which must be executed. Notwithstanding the quietude which prevailed, the trade is in a healthy state, if measured by the test of their being well supplied with orders at all the principal works, and the second-class firms are very well placed in that respect. The demand for America is well sustained ; advices recently received speak of the prospect of a continuance of this for some time, as the markets are bare of stocks of finished iron, and some descriptions are much in request. There is also a confident anticipation that the orders for iron for other parts of the world will increase as the time for shipping comes on. The demand for manufactured iron by home consumers will, also, necessarily be large, so that with such orders as are in hand, and so much in expectation, no doubt whatever exists as to the present prices being upheld through the quarter. Some transactions in pig-iron were reported ; all-mine was quoted at prices varying from 4*l.* 10*s.* to 4*l.* 12*s.* 6*d.* ; and some makes as high as 4*l.* 15*s.* per ton ; cold-blast, 5*l.* 10*s.* to 5*l.* 12*s.* 6*d.* per ton.

The Shropshire ironmasters present reported that the trade in that quarter is brisk. Coal is scarce, and the price is to be again advanced; indeed, it is doubtful if the scarcity of it has at any time been so much felt in the South Staffordshire and East Worcestershire district. Old pits have been re-opened, and are being worked; and the pillars what is called "scrapped," but the supply raised is not nearly equal to the demand. The quantity might be much increased if the colliers would work more, but their habits are such that that is not likely to be the case so long as the wages' scale remains as high as it now is: the thick-coal men are earning 10s. a-day, with an allowance of a ton of coal a month, with "refreshment," yet the mass of them have not a sixpence beforehand, and are consequently unprepared for that reverse which in the iron and coal trades has always been of regular recurrence.

At the *Birmingham* meeting, on the 14th, the attendance was one of the largest that has been seen for many years, and was composed of a section of all those who are in any way interested in the trade. The distant iron-producing districts were well represented, as were also the shippers and home consumers. The amount of business transacted was not very considerable, but that is to be traced to the fact of many of the ironmasters not being in a position to accept more orders in addition to those they have on their books; otherwise the demand for bars to-day was so considerable that large orders would undoubtedly have been given if buyers could have insured their speedy execution; but such is the condition of the trade at this moment that many consumers and others have orders out and are unable to get the iron delivered. Notwithstanding the existence of this peculiar, indeed it may be said exceptional, condition of the trade, there was a very good amount of business done, much more than could have been anticipated, looking at the very large quantity of finished iron which had been previously sold. The transactions in pig-iron were on a moderate scale; consumers would not go beyond 4l. 10s., or at most 4l. 12s. 6d. for hot-blast iron, all-mine; and, as most of them were well bought prior to the last rise in the price of the finished commodity, they will be content to use up their stocks, and whatever supply is not yet delivered before extending their purchases. The quantity of pig-iron used is, however, very large at this moment, and in less than a month consumers will again have to come into the market, and in all probability have to pay an advance on the present price. The cold blast iron is firm at 5l. 10s. Ironstone, the yield of the district, was in good demand, at advancing prices, and a considerable quantity of foreign ore is coming in.

At the *Dudley* meeting (on the 16th) the attendance was small, very few of the principal members of the trade being present. The amount of business reported was only moderate, and was chiefly in pig-iron, the prices ranging at the meetings at Wolverhampton and Birmingham—4l. 10s. to 4l. 12s. 6d. per ton—being steadily adhered to. In manufactured iron there was little or nothing doing; all who are engaged in the trade in this locality are well supplied with orders, and are consequently careless about the acceptance of any others which may be offered. It was stated that the demand for sheet-iron is increasing, and that since the meeting at Birmingham buyers have been anxious to place orders for that description of finished iron, but have found much difficulty in doing so where speedy delivery was made a stipulation. It was stated that there is a probability of the number of furnaces in blast being increased, but it is doubtful if this will be the case while there is such a scarcity of fuel and of labour, the influence of which must operate against any increase in the make of pig-iron in this district at present. Nearly the whole of the pigs stacked some years since have been sold off.

The North Staffordshire Ironstone Sellers' Association held their quarterly meeting at *Tunstall*, on the 5th, when the trade was reported to

be exceedingly active, and the general feeling of the meeting was that this prosperity would be maintained for some time to come. Prices had been been raised, now standing at from 13s. 6d. to 18s. 6d., a considerable advance upon the rates of a few months back, and were fully maintained. The coal trade has been unprecedentedly brisk, and the consumption very large, the demand being considerably in excess of the quantity raised. For native ironstone there has been also a ready sale, and a good quantity of ore is coming in from other districts.

NOTTINGHAMSHIRE.—On January 7th an accident occurred at the *Kimberley Colliery*, Old Basford, by a mass of bind falling upon one of the workmen and crushing him to death.

DERBYSHIRE.—The prospects of the iron trade are reported at present to be very favourable. There has been a brisk demand for all sorts of iron, particularly for the manufacture of armour-plates. Very large orders have also been received for railway iron.

The demand for coal is greatly increasing, partly in consequence of the large consumption of fuel at the iron-works. Several new collieries are being opened up, with good prospects of success.

SOUTH YORKSHIRE.—All the collieries in this district are in full work. The tonnage conveyed by the Great Northern Railway to the metropolis is much in excess of what it was at the same time last year. Navigation is again open, the frost having quite disappeared. A fair amount of business has been done in the iron trade.

The prospectus of a new company, called the *Beverley Iron and Waggon Company* (limited), is being privately circulated. This company is formed under very respectable local auspices, with especial connections in Yorkshire and Manchester, for the purpose of carrying on business as ironfounders and agricultural implement and railway waggon manufacturers. With this view it is intended to purchase from the proprietors of the Beverley (Yorkshire) Ironworks their extensive freehold premises, with the steam-engines, machinery, plant, and stock, which have been lately valued at upwards of 70,000*l.*, and are to be transferred to the Company for 60,000*l.* The business has been carried on upon an extensive scale for upwards of thirty years, and is now in full operation. The capital is fixed at 120,000*l.*, in 6,000 shares of 20*l.* each, but it is proposed to call up only half of the subscribed capital at present. An arrangement has been entered into with the present proprietors, by which one-half of the purchase money may, if desired, remain on security of the property.

SOUTH LANCASHIRE.—The iron trade is still in a satisfactory state, and numerous orders have been received.

The coal trade has been generally characterised by great briskness during the last few weeks, but there has been a slight falling off in the demand for steam-coal, owing to the stoppage of several mills, which has thrown out a large number of workmen. In house-coal a large business has been doing; proprietors have been greatly pressed with orders, many with difficulty supplying them, there having been a deficiency in rolling stock. The men employed by the *Kirkless Hall* Coal Company, who have been on strike for some time past, state that they are willing to work either at their old rate or under the new scale proposed by the firm, provided they receive the advance of 10% given to the other colliers in the district. The refusal of this advance is the reason they give for remaining on strike.

NORTHERN COUNTIES. NORTH LANCASHIRE AND NORTH YORKSHIRE.

NORTHUMBERLAND AND DURHAM.—The coal trade still continues to improve, having exhibited considerable briskness during the last few weeks,

and hopeful prospects are held out for the future. The summing up of the past year's transactions shows a great falling off as compared with former years, indeed since 1861, little progress appears to have been made in the coal trade. Prices are gradually rising, and coke, for which there are large demands, is also dearer. The strike at the Albert Hill Iron Works, Darlington, belonging to Messrs. Barningham, is at an end, and the same may be considered to be the case at Messrs. Straker and Love's collieries. Mr. Love adhered steadily to his resolution of employing none belonging to the Union, and the men belonging to the Brandon Pit in the Auckland district have apparently left the pitmen's union, 60 of them having signed the bond and gone to work, so that colliery and the coke ovens will be immediately at full work. At Willington Colliery the miners are returning to their employment in the same manner. There are still upwards of 600 union pitmen in the neighbourhood of Willington and Brandon, and they will have to seek employment elsewhere.

The iron trade is progressing very rapidly, particularly in Cleveland and South Durham, in which during the last year such an immense demand sprang up for pig-iron, greatly advancing its value. The following figures show the growth of the iron trade in that district since 1858 :—

Place and Owners.	January 1st, 1864.		
	In.	Out.	Total.
Eston—Bolckow and Vaughan	9	—	9
„ Clay Lane Company	3	—	3
„ South Bank Company	3	—	3
Cargo Fleet—Jones, Dunning and Co.	2	—	2
„ Cochrane and Co.	4	—	4
„ Gilkes, Wilson, Pease and Co.	5	—	5
Middlesborough—Bolckow and Vaughan	4	—	4
„ Hopkins and Co.	2	—	2
Port Clarence—Bell Brothers	5	1	6
Norton—Warner, Lucas and Barrett	2	2	4
Stockton—Holdsworth and Co.	3	—	3
Ferry Hill—J. Morrison	3	—	3
Thornaby—W. Whitwell and Co.	3	—	3
Darlington—South Durham Company	3	—	3
Witton Park—Bolckow and Vaughan	4	—	4
Stanhope—Weardale Iron Company	—	1	1
Towlaw—Weardale Iron Company	4	1	5
Consett—Derwent Iron Company	5	18	18
Total	64	18	82
All places, Dec. 1st, 1863	64	18	82
„ Jan. 1st, „	59	21	80
„ „ 1862	50	26	76
„ „ 1861	53	23	76
„ „ 1860	51	18	69
„ „ 1859	58	9	67
„ „ 1858	43	19	62

The total number of blast furnaces on the Tyne, Wear, and Tees is one hundred and five. Only twenty-two are out of blast, and seventeen of these are at Consett. The furnaces in blast yield an average of 17,000 tons per week, and when the twenty-nine new furnaces now in course of

construction are in operation, supposing the trade to be sufficiently brisk to keep them employed, the production on these three rivers will be 20,000 tons a-week, or above one million tons per annum.

A conference of puddlers represented by delegates from the principal iron districts of the kingdom was opened at Gateshead on December 28th. Some of the delegates were of opinion that any tendency towards a general strike should be suppressed, as that of Crewe had not turned out as they expected.

The exports from the Tyne include :—83,929 tons of coal ; 12,830 tons of coke ; and 24,105 cwt. of iron. The imports comprise :—cargoes of sulphur ore from Pomaron and Antwerp ; cargoes of pyrites from Antwerp, Dordt, and Seville ; 7,144 tons of iron from Norkoping ; 103 bars of iron from Laurvig, and 3,214 from Gothenburg ; iron ore from Garrucha ; 18,725 bars of lead from Carthagea ; lead from Seville ; and manganese from Dordt.

SCOTLAND.

Coal has been in good request, both for home use and for export, at full prices, and in some instances there has been an advance of 6d. per ton.

There has been a steady market for all kinds of iron ; makers have been well supplied with orders, and prices firmly maintained.

The Scotch pig-iron trade may be said to have attained last year an unprecedented prosperity. Thus, the computed make in 1863 was 1,150,000 tons, against 1,080,000 tons in 1862, 1,010,000 tons in 1861, 990,000 tons in 1860, 960,000 tons in 1859, 980,000 tons in 1858, 910,000 tons in 1857, 820,000 tons in 1856, 822,000 tons in 1855, 775,000 tons in 1854, 710,000 tons in 1853, and 770,000 tons in 1852. The total deliveries last year were 1,138,000 tons, against 978,000 tons in 1862, 935,000 tons in 1861, 917,000 tons in 1860, 910,000 tons in 1859, 833,000 tons in 1858, 840,000 tons in 1857, 830,000 tons in 1856, 842,000 tons in 1855, 885,000 tons in 1854, 935,000 tons in 1853, and 680,000 tons in 1852. It will be noticed that the demand last year made a very decided stride. The stock, however, on hand at the close of 1863 had increased to 689,000 tons, against 637,000 tons at the close of 1862, 535,000 tons at the close of 1861, 460,000 tons at the close of 1860, 387,000 tons at the close of 1859, 337,000 tons at the close of 1858, 190,000 tons at the close of 1857, 120,000 tons at the close of 1856, 130,000 tons at the close of 1855, 150,000 tons at the close of 1854, 215,000 tons at the close of 1853, and 440,000 tons at the close of 1852. The increase in the deliveries last year is all the more remarkable as the pig-iron of the west of Scotland has now to compete to some extent with that of the Cleveland district, which, although of no account 20 years since, produced last year 810,000 tons, and is expected by 1867 or 1868 to be producing at the rate of 1,250,000 tons per annum. Although the deliveries last year were far larger than in any previous 12 months, the average price for the year in the west of Scotland was only 55s. 9d. per ton, as compared with 53s. per ton in 1862, 49s. 3d. per ton in 1861, 53s. 6d. per ton in 1860, 51s. 9d. per ton in 1859, 54s. 5d. per ton in 1858, 69s. 3d. per ton in 1857, 72s. 6d. per ton in 1856, 70s. 9d. per ton in 1855, 79s. 8d. per ton in 1854, 61s. 5d. per ton in 1853, and 45s. 3d. per ton in 1852. The increase in the deliveries last year was stimulated in a great measure by the developement of local consumption, which in 1863 absorbed 518,000 tons, against 407,000 tons in 1862, 350,000 tons in 1861, 350,000 tons in 1860, 343,000 tons in 1859, 275,000 tons in 1858, 312,000 tons in 1857, 325,000 tons in 1856, 300,000 tons in each year in 1855, 1854, and 1853, and 245,000 tons in 1852. The increase in the local consumption has been occasioned by the extraordinary developement which iron shipbuilding has acquired of late on the Clyde, as the occasional

notices of this industry have abundantly testified. The total foreign shipments amounted last year to 290,000 tons, against 255,000 in 1862, 266,870 tons in 1861, 230,000 tons in 1860, 254,240 tons in 1859, 238,120 tons in 1858, 294,230 tons in 1857, 258,740 tons in 1856, 244,320 tons in 1855, 218,900 tons in 1854, 318,020 tons in 1853, and 224,370 tons in 1852. Of these shipments France last year took 63,000 tons, against 77,000 tons in 1862, and 61,000 tons in 1861; Germany and Holland, 116,000 tons last year, against 104,000 tons in 1862, and 94,000 tons in 1861; Spain and Portugal, 13,000 tons last year, against 11,000 tons in 1862, and 13,000 tons in 1861; Italy, 17,000 tons last year, against 20,000 tons in 1862, and 25,000 tons in 1861; the United States, 45,000 tons last year, against 20,000 tons in 1862, and 31,000 tons in 1861; and British America, 24,500 tons last year, against 15,000 tons in 1862, and 17,000 tons in 1861. The total deliveries coastwise and by railway to England last year were 330,000 tons, against 316,000 tons in 1862, 318,130 tons in 1861, 337,000 tons in 1860, 312,750 tons in 1859, 319,870 tons in 1858, 233,770 tons in 1857, 246,260 tons in 1856, 297,680 tons in 1855, 301,100 tons in 1854, 316,980 tons in 1853, and 210,530 tons in 1852. The average number of furnaces in blast last year was 127, against 120 in 1862, 123 in 1861, 121 in 1860, 124 in 1859, 129 in 1858, 128 in 1857, 117 in 1856, 117 in 1855, 116 in 1854, 111 in 1853, and 110 in 1852. The average delivery of each furnace is thus considerably more than in former years.

CONTINENT OF EUROPE AND MEDITERRANEAN COUNTRIES.

FRANCE.—The iron trade still continues dull, and especially at St. Dizier, where prices have been with difficulty sustained. The firm of Wendel has concluded a contract for rails with America. During the last eight years there has been a great increase in the production of iron. A recent official document shows that in 1863 there were produced in France 1,180,000 tons of pig-iron, showing an increase of 127,000 tons on the corresponding total of 1862.

The *Quiros* Coal Mining Company, in the Spanish Asturias, has just been converted into a French Company with limited liability. The share capital will be 40,000*l.*, represented by 2,000 shares of 20*l.* each. The company will be managed by a council of nine members taken from among the associated capitalists, and the nine directors must be proprietors of one-twentieth of the share capital.

BELGIUM.—The position of the iron trade has remained about the same during the past month, as the ironmasters consider that if, instead of imitating the rise in England, prices are maintained at their present rates, they will be better able to develop the trade, both in their own country and in other parts of Europe.

From an account of the iron-trade of Belgium, published in the official report by Her Majesty's Secretary of Legation at Brussels, it appears that the great bulk of the iron produced is now raised from the so-called "free iron mines," i.e., mines not legally conceded. Belgium possessed in 1820 about fifty iron blast-furnaces adapted for charcoal, and not one for coke. Since then a great number of the latter have sprung up in the coal-basins of Liege and Charleroi. Numerous refining and cupola furnaces, as well as puddling, rolling, hammering, splitting, and wire-mills, have been erected and supplied with the best appliances. The wealth created by this metal alone was estimated at 81,000,000*fr.* in 1860, and the export at 24,750,000*fr.* Belgium does not possess, like Wales, beds of iron and coal overlaying each other in the same mine, but possesses both in close proximity to each other.

The number of smelting-furnaces in blast has fallen from 66 in 1857 to

51 in 1860, only one more in 1820; but these 51 being all, with eight exceptions, adapted for coke, produced 319,943 tons of pig-iron, valued at 26,500,000fr., probably four times the amount of the earlier period. Still these figures show a great falling off since 1857.

The iron exports of all kinds have risen from 11,750,000fr. in 1851 to 25,000,000fr. in 1857 and 1860. The export of pig-iron has receded since 1857, owing to the increase of duty in the Zollverein; but that of ores and wrought-iron has been, and is, constantly progressing. The year 1861, however, has been one of depression.

The *Charleroi* coal proprietors suffered somewhat last year, but although the Charleroi basin does not appear to have been very prosperous, the total exports of coal and coke from all the Belgian basins combined amounted during the first eleven months of 1863 to 3,040,597 tons, against 2,963,000 tons in the corresponding period of 1862, and 3,032,789 tons in the corresponding period of 1861.

HANOVER.—The following has been the production of the ironworks for the year 1862-63. The number of works is 5; the make of pig-iron from 5 blast-furnaces amounted to 86,985 ctrs. The quantity of cast-iron produced by blast-furnaces was 35,028 ctrs., and by cupola furnaces 9,448 ctrs. The manufacture of bar-iron reached 30,869 ctrs.: 23,043 ctrs. from refinery furnaces, and 7,826 ctrs. from puddling furnaces. The manufacture of hammered and rolled iron reached 8,382 ctrs. The quantity of iron wire was 643 ctrs., and the quantity of steel was 1,623 ctrs. For the production of the 86,985 ctrs. of pig-iron 251,313 ctrs. of ironstone and flux were required, and the number of workmen employed amounted to 2,260. The value of the total production of the ironworks was 396,000 thlrs., or about 60,000*l*.

RUSSIA.—It is stated that a district has been discovered in Russia of similar formation to that of the oil-producing regions of Pennsylvania and other parts of America, and that an American has obtained a concession from the Russian government of a tract of 50,000 acres.

ITALY.—The *Vallanzasca* Gold Mining Company have received advices stating that a discovery has lately been made in the end of Cadorna's level in driving on the Mazzeria lode, which promises great results, the lode being fully 4' wide, and rich for gold. As this level is further advanced in the mountain than any of the others, the increase of its value from about $\frac{1}{2}$ oz. to 3 oz. of gold per ton, its present percentage, is considered very important. The new mill gives great satisfaction, and its success is considered an established fact. Captain Roberts reports that the communication between the Cava Vecchia and the Piazza Nuova level has been opened, and the tramway in the Cava Vecchia level extended 50 fms. The shoots are in progress, and if nothing unforeseen occurs, this spring will see the system of tramways and shoots completed, and all the principal workings of the mine will be in direct communication with each other. Owing to the severe weather, operations for the construction of the new amalgamating works and machinery have been limited. The amalgam smelted has given 1,800 grammes, or about 58 oz. of gold, from 116 tons of ordinary ore, showing an average of $\frac{1}{2}$ oz. to the ton.

NORTH AMERICA.

CANADA.—Reports from the *Chaudière* gold regions are very encouraging. Some Lower Canada writers anticipate that 20,000 diggers will be congregated along the banks of the Chaudière and its tributaries next spring.

The *English and Canadian* Mining Company have received their report for December. The stope at Fanny Eliza, No. 2, yielded from 10 fms. of

ground, between 7 and 8 tons of 40 per cent. ore when dressed, and there is a fine branch of ore now standing along the bottom. It is found necessary to put in a tramroad, so as to get away the ore more conveniently. Williams' winze was sunk 4 fms., and a good course of ground had come in: Sayles shaft was sunk 3 fms. The new crusher was commenced to be put in, and it was hoped would be ready in good time for commencing spring operations.

NOVA SCOTIA.—According to the *Halifax Colonist*, the Nova Scotian gold mines yielded last quarter 4,620 ounces of gold. As about 1,000 men are reported to be engaged on them, this would show an average wage of 6¢ per man per month, the traditional dollar a-day of the Lower Provinces.

BRITISH COLUMBIA.—Advices from Victoria, Vancouver's Island, report that there has been great excitement there ever since the discovery of gold in the vicinity of that city. It was thought at first that the "placer," or shallow diggings, would pay well; but although the first indications were very favourable, it is the opinion of many experienced miners that there is very little prospect of establishing what are called there "poor man's diggings." That however is comparatively of little consequence, since, to make up for the failure of the "placer" diggings, several rich quartz reefs have been discovered. It is matter for astonishment that up to this time no one should have noticed the peculiarly auriferous features of the country in the neighbourhood of Gold Stream. The land is rough and mountainous, rising in the centre of the district to a ridge, in which the quartz may be seen cropping out in every direction. A large tract of country has been already pre-empted, and four or five companies have been formed, for the purpose of working it. Specimens which have been assayed yielded a result of \$196 to the ton. A number of copper-bearing veins have also been found, but of what value has not hitherto been ascertained.

LAKE SUPERIOR REGION.—The *Lake Superior News and Journal* mentions the discovery of a vein of rich copper ore at the *Lake Superior* mine, which seems likely to add largely to the profits of mining. The vein is enclosed in walls of iron stone, and extends across the formation, running in a northerly and southerly course. The appearance of the vein mass is not very different from ordinary hematite and decomposed slaty iron ore, being evidently coloured by the iron with which it is in contact. It consists principally of a black oxide, but contains some traces of sulphide of copper, and is somewhat mingled with iron ore. It is quite soft, and from some imperfect tests made, it is thought to contain from 5 to 50 per cent. of copper. The vein has been traced about 70 feet on the surface, and the iron mining operations have opened it to a depth of 40'. The general width is about 4", but in places pockets are found 3' or more in thickness. This vein mass has been heretofore taken out together with the iron ore with which it is enclosed, and shipped with it as iron ore. Had this been supposed to be a copper region, the copper vein would undoubtedly have been discovered long ago; but being in an iron mine, within walls of iron ore, and having the general appearance of decomposed iron ore, nothing was thought of it. The value of this discovery cannot at present be determined; but so long as it is found in iron ore, it can be mined without extra expense. In quarrying out the iron, all that has been done is to gather up the copper ore by itself, and realize an average of \$75 to \$100 per ton, as such, instead of the price of iron ore. The work is so far comparatively only surface work; and it is hoped that in depth it may widen, or that at least the pockets may be more frequent, and that it may consequently become profitable to work even independent of the iron. It is hoped in the district, and probably not without reason, that other veins of equal or greater richness may yet be found. Similar veins have been

discovered in the silver lead district, crossing the formation like this, and there is no apparent reason why they should not be found in the iron range.

The *Minnesota* Mine is said to have improved lately in the deeper points ; and the prospects of the *National* Mine continues to be favourable. The *Rockland* is preserving in spite of many discouraging circumstances. A new engine has been placed to command the hoisting on the south lode, which will enable a great deal of stoping to be done from ground already laid open, the results of which will be watched with interest. Portions of the *Rockland* north lode are showing well for copper, and it is confidently anticipated that before long this mine will appear to good advantage.

The *Superior* Mining Company have had their present mining works and vein openings made by means of an adit leading through the *Flint Steel* River mine property ; a misunderstanding having arisen between the companies, the *Superior* are denied admittance to their works through the *Flint Steel* grounds, consequently their vein workings are thrown idle. In anticipation of such a difficulty as this, and to obviate it, the *Superior* have been sinking a shaft for the past two years to enter their vein independent of the *Flint Steel* adit. It is expected that this shaft will be connected soon with the deeper workings in the vein, which, when accomplished, will place the *Superior* on good footing, for the vein is rich—said to be equal to any in the district for the amount of ground opened on under adit.

The *Flint Steel* River mine has made some rich developements recently : a wide rich lode has been opened on, yielding mass copper in three and four ton pieces, and barrel and stamp work in profusion. This mine was worked some years ago, and, after the expenditure of over \$100,000, was deemed to be worthless and consigned to inactivity. The recent revival in mining brought out, among others, the *Flint Steel*, the expenditure on which had been but merely nominal when the present lode was opened.

UNITED (ATLANTIC) STATES.—The following is an abstract of the quantity of coal conveyed by the six great anthracite carriers of Eastern Pennsylvania during the last four years :—

	1863.	1862.	1861.	1860.
	Tons.	Tons.	Tons.	Tons.
Phila. and Reading R. R. ..	3,064,645	2,305,604	1,460,832	1,878,156
Dela. and Hudson Canal ..	1,480,105	1,238,154	1,356,301	1,201,091
Del., Lack. & Western R. R. ..	1,223,166	1,094,315	1,104,319	1,080,228
Schuylkill Canal ..	885,542	980,727	1,183,570	1,356,688
Lehigh Valley Railroad ..	1,195,155	882,574	743,762	730,642
Lehigh Canal ..	699,558	396,227	994,705	1,091,032
Totals ..	8,558,171	6,897,601	6,843,489	7,337,837

Tonnage of 1863 over tonnage for 1860 1,220,334 tons.

Thus it appears that, in three years, the increase has only been 16 per cent.

In round numbers, 950,000 barrels of crude petroleum have been received in Pittsburgh from September 1st, 1862, to September 1st, 1863 ; and had the Allegheny river been navigable for ten months in the year, the receipts would have been one-third greater. With the exception of about 10,000 barrels, the entire amount was carried by the Allegheny river.

Two-thirds of the crude petroleum at Pittsburgh was refined by the refineries in and around the city, of which there are over sixty. Of their capacity there is no official data, but it may be judged that, running

to their full extent, they would require about 1,500,000 barrels of crude petroleum to supply their demand.

UNITED (WESTERN) STATES.—A company has been recently organised, called the *Saginaw Valley Land, Salt, and Mineral Company*, whose property amounts to 60,000 acres of land, in the Saginaw Valley, Upper Michigan. There is still great excitement about the silver-lead discoveries recently made in Michigan, and in addition to this it is stated that a sample of iron pyrites, said to have been taken from a quartz lode in the silver-lead region, was on analysis found to be very rich in gold—the value for the ton of rock being above the average of that of the ore of Colorado.

CALIFORNIA AND BORDER TERRITORIES.—The exports of gold from California from the first of January to the 7th of December, 1863, compared with the amount exported during the same time in 1862, were as follows:—

1863 to December 7	..	..	..	..	\$42,769,998
1862 to December 7	..	..	..	..	39,358,510
Excess in 1863	..	..	..	..	<u>\$3,411,488</u>

The *Montana Gold Company* are actively pushing on operations. A thirty-stamp quartz mill is in course of erection, with ample steam power, and all the latest improvements in quartz-crushing machinery. At the date of the advices the Kansas lode had been sunk on to a depth of 25'. The reports from Colorado continue to be very favourable, and there have lately been a great many new discoveries there. Accounts from *El Paso*, dated Oct. 22nd, report that mining there is pretty nearly at a standstill, in consequence of all the miners having been attracted to the new placer diggings, two or three hundred miles to the east of that district. The *Arizona* gold-fields are reported to be opening up very favourably. One company, consisting of nine persons, is obtaining about half an arroba (25 lbs.) per day. All the gold is in coarse grains, and most of it is found on the surface; the earth which covers it being generally removed by the blade of a knife or a bayonet.

From Calaveras they report that some of the *Campo Seco* mines are raising fine quality ore. It is generally believed that copper cannot be found near the surface, and companies are sinking their shafts one or two hundred feet before they lose confidence. It is said that some good discoveries of copper have been made in *Indian Valley*, about forty miles north-west of Colusi. The copper prospects in the new mines on the *Ghowchilla* are said to be improving, and, it is to be hoped, will soon give good results. The *Gardiner* company, a few miles above Auburn, have struck a ledge 14" thick, which is expected to assay from 20% to 30%. The *Illinois* and *Golden Age* mining companies, Reese River, intend vigorously to prosecute their operations during the winter months. They have both a good deal of ore out, and their prospects are reported to be very encouraging. The mines of the *San Antonio* district are developing very fast and are expected to yield good profit.

The *Monte Diablo* coal mines are reported to be sending to market 4,000 tons per month, and the quality of the coal is improving, realising at present \$10 per ton.

MEXICO.—The *United Mexican Mining Company* have received their monthly report. There had been no variation of importance in the mine, but the workings in Angeles and La Trinidad had been resumed, and the ore raised was of better quality than from any other part of the mine.

The directors of the *El-Chico* Company have sent out Mr W. F. D. Stephens to take possession of the mines and reduction works on behalf of the company, and to make arrangements for their working.

SOUTH AMERICA.

BRAZIL.—The *Don Pedro North del Rey* Gold Mining Company have issued a notice that they have no connection with a project called the *Rossa Grande* Gold Mining Company. "An offer," they state, "was made to the directors, but they considered it expedient, for satisfactory reasons, not to entertain the matter."

The directors of *St. John Del Rey* Mining Company have received by telegram from Lisbon the following report:—Produce for November, 41,450 oitavas; cost for ditto, 10,346*l*.; profit for ditto, 5,638*l*.; produce 11 days of December, 12,598 oitavas; yield, 5,953 oitavas per ton. General operations going on well.

BOLIVIA.—The Lords of the Committee of Privy Council for Trade have received, from the Secretary of State for Foreign Affairs, a translation of a decree of the Bolivian government, forwarded by Her Majesty's chargé d'affaires in Chili, fixing the following duties on the exportation of bar copper and tin from Bolivia:—Bar copper exported by sea, 1 real; small ditto ditto, 2 reals; bar tin exported by sea or by land, 1 real; small ditto ditto, $\frac{1}{2}$ real, per quintal.

CHILI.—A new mining company has been formed, called the *Panulcillo* Copper Company. The proposed capital is 200,000*l*., in 50,000 shares of 4*l*. each. The copper mine which it is proposed to purchase and work is situated about 43 miles from the port of Coquimbo. For 29 miles of this distance there is railway communication, which will shortly be extended to the mine, and materially diminish the cost of transport. The mine is said to be inexhaustible, yielding no less than 28,000 to 30,000 tons of clean ore annually. The lode is reported to be 60 feet wide, and the cost of raising the ore is stated to be only about 10*s*. per ton. Seven furnaces are already at work. The company is to acquire the mine, together with the tramways, roads, houses, plant, &c., for 120,000*l*., of which 40,000*l*. is to be taken in shares (viz., 16,000 shares with 2*l*. 10*s*. paid) and 80,000*l*. in cash, payable by instalments out of the calls.

AUSTRALASIA.

VICTORIA.—Advices from Melbourne, dated Nov. 26th, report that there had been considerable activity at the gold fields during that month, and mining operations had been carried on on a more extensive scale.

The directors of the *Port Phillip and Colonial* Gold Mining Company have received by telegram from Suez the following advice, giving the result of the operations of the month of October last:—Quantity of quartz crushed, 4,504 tons; yield per ton, gold, 8 dwts. 10 grs.; receipts, 3,300*l*.; payments ordinary, 1,620*l*.; profit, 1,680*l*.; remittance, 1,000*l*. Yield much improving.

It is said that a fine discovery of black lead has been made in the clay slate of Yackandandah, and in thin quartz seams at Reid's Creek.

NEW SOUTH WALES.—A discovery of iron ore, which promises to be of considerable importance, has been made in the Ilawarra district. The *Woonoona* coal mines have stopped in consequence of the insolvency of the lessors. It is hoped, however, that some means will soon be found of resuming the working, as their stoppage for any length of time would cause considerable loss to the district.

SOUTH AUSTRALIA.—The Australian companies have received advices up to the 26th of November last. From *Kapunda* the directors have advices to the 26th of November, at which date all was going on satisfactorily. The quantity of ore raised in September was 300 tons of 17 $\frac{1}{4}$ % average

produce, equal to 52 tons of pure copper, exclusive of 73 tons of sulphur ores for flux. The quantity raised in October is estimated at about 450 tons, wet weight, also of good percentage. Since the last advices 65 tons of copper had been shipped.

The advices from *Worthing* report that the lode in the 53 south at Leggs had greatly improved. The ore was of a more solid compact nature, and has become worth from 8 to 10 tons per fathom. The lode in the 53 north end was rather disordered, in consequence of being near the slide; 43 end south yields from 3 to 4 tons per fathom. The stopes were all working well, and machinery in good order. Smelting going on very satisfactorily; 260 tons of ore sampled; 72 tons of regulus returned, being the largest quantity yet made; 40 tons regulus on hand, and about 200 tons of ore ready for smelting. Profit on month's working, 840*l*.

At *English and Scottish Australian* the smelting operations were being actively carried on. There were six furnaces and one refinery at work at Port Adelaide, and three furnaces and one refinery at Koorunga. Another furnace was shortly to be lighted there. The company's teams were in good working order. Since date of last advices further shipments of 216 tons 10 cwts. copper had been made.

At *Scottish Australian* the working had been much retarded by the very wet weather. At the Lambton colliery the works had gone on satisfactorily.

From *Yudanamutana* the state of the mine throughout is reported to be very satisfactory, and the smelting furnace was expected to be in full work in three weeks from that time.

Record of the Mining and Metal Markets.

METALLIC-ORE MARKETS.

TIN.—The standards for black tin had been advanced 4*l*. up to the 20th, and another advance of 2*l*. is reported, of which we have not received an official announcement. Assuming this last advance they now stand at:—

Superior Fine	..	£113	....	Superior Common	..	£110
Second Fine	..	111	....	Second Common	..	109

COPPER.—At the three Cornish sales we give this month, the number of tons, average produce, quantity of fine copper, average price per ton, and standard have been as follows:—

Date.	Tons.	Produce.	Fine Copper.		Price per ton.	Standard.
			Tons.	cwt.		
Dec. 31.	.. 3,281	.. 6½	.. 225	2	£6 0 6	.. £128 0 0
Jan. 7.	.. 1,815	.. 6	.. 108	7	5 9 0	.. 136 18 6
„ 21.	.. 5,529	.. 5½	.. 308	4	5 6 0	.. 144 6 0

The copper standard has largely advanced at each sale during the past month. At the sale of the 31st, the advance was 4*l*. 7*s*.; at that of Jan. 7th, 4*l*. 10*s*.; and at that of the 21st, 3*l*. 16*s*.; making altogether an advance of upwards of 12*l*. in three sales.

LEAD.—There is no material difference between the prices we give this month and those of last.

COAL MARKETS.

LONDON, *January 28th*.—From the returns of the Registrar of the London Coal Exchange, of the quantity of sea-borne coal, culm, and cinders, imported into London in the month of December, we learn that the total quantity was 339,532 tons, against 348,054 tons during the corresponding month of last year,—showing a *decrease* of 8,522 tons.

The following are the particulars of the 339,532 tons imported during December:—

Newcastle .. 152,273 tons in 372 ships	Scotland .. 2,778 tons in 13 ships
Seaham .. 15,703 " 62 "	Wales .. 3,038 " 10 "
Sunderland .. 97,168 " 221 "	Yorkshire .. 2,652 " 18 "
Middlesbro'. 6,584 " 18 "	Small .. 2,784 " 9 "
Hartlepool.. 53,291 " 179 "	Cinders .. 1,459 " 8 "
Blyth .. 1,802 " 6 "	

The quantity of coal imported by railways and canals during the month of December was 162,458 tons, being a *decrease* compared with the preceding months. For the whole year the receipts by railway were 1,775,487 tons 4 cwts., against 1,513,296 tons 2 cwts. in 1862, showing an *increase* of no less than 262,191 tons 2 cwts. The canal carriage for 1863 was 9,226 tons, as compared with 11,553 tons in 1862, being a *decrease* of 2,327 tons.

The total quantity of sea-borne coal, culm, and cinders imported into London during the year 1863 was 3,336,174 tons, of which the following are the particulars:—

Ships.				Ships.			
Newcastle ..	1,201,622 tons in	3,637	Scotland..	..	22,458 tons in	122	
Seaham ..	227,418 "	906	Wales ..	..	104,513 "	242
Sunderland ..	988,109 "	2,342	Yorkshire ..	..	38,115 "	337
Middlesboro'..	72,430 "	257	Duff ..	..	2,001 "	7
Hartlepool ..	621,379 "	2,176	Small ..	..	23,058 "	78
Blyth..	17,175 "	63	Cinders ..	..	16,896 "	120

On December 30th, the new ships arrived were 20; house-coal was in steady request, Hartley's heavy, and declined 3*d.*; Hetton Wallsend, 20*s.*; South Hetton Wallsend, 19*s.* 6*d.*; Haswell Wallsend, 19*s.*; Tees Wallsend, 18*s.*; Braddyll's Wallsend, 18*s.* 6*d.*; Eden Main, 18*s.*; Belmont Wallsend, 16*s.* 6*d.*; Heugh Hall Wallsend, 16*s.* 9*d.* On January 1st, new ships 17; market firm, and Hartley's advanced 3*d.* On the 4th, new ships 19; a great demand for house-coal, which was entirely cleared of, at an advance of 1*s.* 6*d.* per ton; Hartley's in request and 1*s.* per ton higher. On the 4th, only 4 steamers; a further rise of 1*s.* 6*d.* per ton in Hartley's. On the 8th, the 10 arrivals were all steamers; house-coal again advanced. On the 11th, fresh arrivals 25, mostly steamers; market flat. On the 13th, the fresh arrivals were again nearly all steamers; market heavy, and house-coal reduced 1*s.* 6*d.* per ton. On the 15th, the new arrivals were 14 steamers; market firmer, and housecoal sold freely at higher prices. On the 18th, new ships 51; market dull. On the 20th, fresh arrivals mostly steamers; house-coal depressed, and prices generally declined from 1*s.* to 1*s.* 6*d.* per ton. On the 22nd, no new ships arrived, but 330 at sea. On the 25th, new ships 53, of all kinds. Business in house-coal almost nominal; Hartley's reduced 1*s.* 6*d.* On the 27th, new ships 315, a dull market and a general decline in prices; Hetton Wallsend, 20*s.*; South Hetton Wallsend, 20*s.*; Lambton Wallsend, 19*s.* 6*d.*; Tees Wallsend, 19*s.* 3*d.*; Braddyll's Wallsend, 18*s.* 9*d.*; Eden Main, 18*s.*; South Kilroe Wallsend, 18*s.*; Heugh Hall Wallsend, 18*s.*; Belmont Wallsend, 17*s.*; Hasting's Hartley, 14*s.* 6*d.*; Holywell Main, 17*s.*

LIVERPOOL.—From Messrs. J. and T. Platt's Coal Circular for December, we find that the quantity of coal, cannel, coke, and patent fuel shipped from Liverpool to foreign and colonial ports during the month of December was 53,977 tons, against 61,826 tons during the corresponding month of last year—showing a decrease of 7,849 tons. The total shipments from January to December were 597,851 tons, against 642,279 tons in the corresponding period last year—showing a decrease of 44,428 tons. The exports coastwise during December were 7,618 tons, against 7,331 tons during the same month last year—showing an increase of 287 tons. The total exports coastwise from January to December were 105,178 tons, against 85,036 tons during the corresponding period of last year—showing an increase of 20,142 tons.

CONTRACTS FOR COAL.—The Admiralty require the supply of 2,500 tons of South Wales coal, to be delivered at Fernando Po; 300 tons to be delivered at Calloa, 1,000 tons to be delivered at the Piræus, and 7,200 at Gibraltar. The Royal Spanish Naval Commission require 2,000 tons of coal at Samanca, and 1,000 tons at San Juan, Porto Rico.

SHARE MARKETS.

LONDON, *January 28th*.—The market opened strongly at the end of last month, stocks becoming generally firmer with the improved prices of metals. There was a little dullness about the 11th and 12th, in sympathy with the depression in the Stock Exchange, but the continued and almost unprecedented rapid rise in the copper standard soon caused a rally, and a general advance of quotations took place. Prices closed firm with a decidedly upward tendency. The fortnightly settlement being this day, general business is quiet. The principal alterations have been:—

Advanced.

East Caradon	slightly	Providence	£2
South Caradon	£10	Wheal Margaret	3
Trelawny	4	Wheal Buller	15
Wheal Chiverton	2½	East Basset	10
Mary Ann	2	Devon Consols	25
West Chiverton	slightly	East Carn Brea	1
Clifford Amalgamated	£4½	South Tolgus	5
Nanjiles	2½	Wheal Uny	2
St. Day United	3s.	North Downs	1½
Wheal Seton	£15	Bryn Gwiog	1½
Great Fortune	2	Cobre	3½
East Lovell	1	Cape Copper	1

Declined.

West Seton	£10	South Frances	£5
Wendron Consols	5	New Rosewarne	5½
Wheal Grylls	1½	St. John Del Rey	5

East Caradon shares have been slightly better, principally in consequence of the rise in the copper standard. They opened at 26¾l.-27l. on the 30th, when they were in demand and advanced 10s., and again advanced on the 2nd a further 10s. On the 6th shares were in especial request, and were quoted at 27½l.-28l. They then declined until the 21st, notwithstanding that they were largely dealt and were in considerable demand, when they improved to 27½l.-27¾l., but close flatter at 27l.-27½l. *South Caradon* shares have for the same reason advanced from 420l.-430l. to 430l.-440l. *West Caradon*, 20l.-22l. *Glasgow Caradon Consols*, 3½l.-4l. *Caradon Vale*, 3l.-3½l. *Marke Valley*, dull at 6½l.-6¾l. *Gonamena*, 2½l.-3½l.

Wheal Trelawny shares have risen into request, having advanced steadily from their opening prices of 21*l.*-22*l.* to their closing ones of 25*l.*-26*l.* *Wheal Chiverton* shares have also been better; they opened on the 30th at 9*l.*-9½*l.*, and were last mentioned at 11½*l.*-12*l.* *West Chiverton* has been well maintained, shares having been pretty largely dealt in at 54*l.*-55*l.* *Chiverton Moor* shares have been dealt in at 5½*l.*-6*l.*, but close a little lower at 5½*l.*-5¾*l.* *Wheal Mary Ann* improved to 14*l.*-14½*l.* *Wheal Ludcott and Wrey*, 1½*l.*-1¾*l.* *East Chiverton*, 5*l.*-5½*l.* *Herodsfoot*, 37*l.*-39*l.* *Wheal Hope*, 4½*l.*-5*l.* *North Chiverton*, 2*l.*-2½*l.*

Clifford Amalgamated shares have been in good demand and have steadily improved from their opening quotation of 34*l.*-34½*l.* to their closing quotation of 38½*l.*-39*l.* *Nanjiles* shares have also improved, and have been in good demand. On the 30th, they opened at 30½*l.*-31½*l.*, but declined slightly until about the middle of the month, when they became firmer, being quoted on the 14th at 29½*l.*-30½*l.*, and again on the 20th at 31½*l.*-32*l.*; shares close stronger at 32½*l.*-33½*l.* *St. Day United* shares have improved from 32*s.*-34*s.* to their closing price of 35*s.*-37*s.* 6*d.*, going up at one time to 37*s.*-39*s.* *Great Wheal Busy* shares largely dealt in at 3½*l.*-4*l.* *Grambler and St. Aubyn* dull at 10*l.*-11*l.*

There has been an improvement in *Wheal Seton* shares, which opened on the 30th at 145*l.*-150*l.*, and after fluctuating a little, went up 7*l.* 10*s.* on the 25th, in strong demand. After this they declined, but again close stronger at 160*l.*-165*l.* *West Seton* shares closed at a reduction of 15*l.*, being quoted at 190*l.*-195*l.* *North Roskear*, 22*l.*-23*l.* *North Crofty*, 5½*l.*-5¾*l.* *Tincroft*, 19½*l.*-20*l.* *Cook's Kitchen*, 21*l.*-22*l.* *Stray Park*, 28*l.*-30*l.* *Wheal Crofty*, 2*l.*-2½*l.* *Wheal Harriett*, 32*s.* 6*d.*-35*s.* *Camborne Vein*, 2½*l.*-2¾*l.* *Condurrow*, 100*l.*-110*l.* *South Condurrow*, 10*s.*-12*s.* 6*d.* *East Pool*, 500*l.*-520*l.*

Great Wheal Fortune shares have shown more briskness since our last quotation. They opened on the 30th at 19*l.*-20*l.*, and rose on the 7th to 21*l.*-23*l.* Shares were in demand on the 11th at a further rise of 2*l.*, and on the 20th reached 25*l.*-26*l.*, but before closing they became very heavy, receding to 20*l.*-22*l.* *East Lovell* shares slightly better at 9*l.*-9½*l.* *Providence* shares have had an upward tendency, and leave off at 44*l.*-46*l.*

Wendron Consols shares have declined nearly 5*l.* since they were last mentioned in November. They were then quoted at 10*l.*-11*l.*, and now close at 6½*l.*-6¾*l.* *Wheal Margaret* shares opened at last month's prices of 14*l.*-16*l.*, and during the early part of the month went as high as 21*l.*-23*l.*, at which they were inquired for. They did not however maintain their price, but fell at one time to 15*l.*-17*l.*, from which they have since rallied, closing at 17*l.*-19*l.* *Wheal Grylls* shares have declined from last quotation of 28*l.*-29*l.* to 26½*l.*-27½*l.* *Basset and Grylls*, 16½*l.*-17½*l.* *Rosewall Hill and Ransom United*, 3*l.*-3½*l.* *Great Wheal Vor*, 15*l.*-15½*l.* *East Grylls*, 13½*l.*-14*l.* *East Providence*, 4½*l.*-4¾*l.* *Garlidna*, 1*l.*-1½*l.* *Great Grylls*, 4½*l.*-4¾*l.* *Trelyon Consols*, 10*l.*-12*l.*

Wheal Buller shares have advanced 15*l.* in the past month in consequence of the probability of the mine being now worked with more energy. They opened on the 30th at 22*l.*-24*l.*, on the 8th were quoted at 23*l.*-25*l.* and on the 20th rose to 30*l.*-35*l.*, at which they remained until the 26th, when they again improved to 32½*l.*-37½*l.*, with inquiries. They closed with a further advance, at 35*l.*-40*l.* There has been a decline of 5*l.* in *South Frances* shares, which are quoted at 55*l.*-60*l.* *East Basset* shares have improved 10*l.*, their closing prices being 67½*l.*-70*l.* In *Wheal Basset* shares there has been a slight decline, as they opened at 82½*l.*-87½*l.*, but left off at 77½*l.*-82½*l.* *North Basset*, 2½*l.*-2¾*l.* *South Basset*, 8½*l.*-9½*l.* *West Basset*, 10½*l.*-11*l.* *Wheal Grenville* shares have been steady, prices having varied but little, they close at 4½*l.*-4¾*l.* *East Grenville*, 2½*l.*-2¾*l.* *Copper Hill*, 11½*l.*-12½*l.*

Devon Great Consols have improved 25*l.*, opening at 545*l.*-555*l.*, and closing at 570*l.*-580*l.* *East Russell* shares have been fairly dealt in, but have not changed much in price. They were last quoted at 5*l.*-5½*l.* *Drakevalls* shares opened at 35*s.*-37*s.*, and on the 1st rose to 1¾*l.*-2*l.*, but declined again, closing at 36*s.*-38*s.* *Wheal Crebor* shares flat at 35*s.*-37*s.* *New Martha*, 1¼*l.*-1½*l.* *Hingston Down*, 3¼*l.*-3½*l.* *Lady Bertha*, 14*s.*-15*s.* *Kelly Bray*, 12*s.* 6*d.*-15*s.* *East Gunnis Lake and South Bedford*, 1*l.*-1½*l.* *Wheal Edward*, 1¼*l.*-1½*l.* *Wheal Arthur*, 7*s.*-9*s.*

East Carn Brea shares have been rather flat with little change. On the 30th they opened at 6¼*l.*-6½*l.*, and went up by the 5th to 8¼*l.*-8½*l.*, but close lower at 7*l.*-7¼*l.* *South Tolgus* shares opened on the 30th at 39*l.*-40*l.*, and have improved, with all copper producing mines, to their closing price of 43*l.*-44*l.* *Wheal Uny* shares have improved from 5*l.*-5½*l.* to 7¼*l.*-7½*l.* *North Downs* have improved from 1¼*l.*-1½*l.* to 2*l.*-2¼*l.* *Great South Tolgus*, 4¼*l.*-4½*l.* *Wheal Union*, 3¼*l.*-3½*l.* *Carn Brea*, 68¼*l.*-70*l.* *North Treskerby*, 2½*l.*-3¼*l.*

New Rosewarne shares have gone down rapidly during the month, at one time being quoted as low as 7¼*l.*-8*l.* They opened on the 30th at 14*l.*-15*l.*, and declined steadily till the 7th, when they were at their lowest, from which they rallied until the 21st, when they were reported as in demand at 11*l.*-12*l.*, but they have again become flatter, and close 8¼*l.*-9¼*l.* *East Rosewarne*, 2½*l.*-2½*l.* *Wheal Unity*, 8*s.*-10*s.* *Wheal Kitty* (St. Agnes), 7¼*l.*-8*l.* *Prosper United*, in request at 5¼*l.*-5½*l.* *Pendeen*, 6¼*l.*-7*l.* *Treloeweth*, 1¼*l.*-2*l.* *New Birch Tor and Vitiſer*, 2½*l.*-3*l.*

In Welsh mines prices have been quoted as follows:—*Bryn Gwilog*, 34¼*l.*-35¼*l.* *North Minera*, 6*s.*-7*s.* *Central Minera*, 2½*l.*-3¼*l.* *Minera*, 260*l.*-265*l.* *Prince of Wales*, 5*s.*-6*s.* *Bedol-Aur*, 10*s.*-12*s.* 6*d.* *Dale*, 13*s.*-15*s.* *Rhymney Iron*, 29*l.*

Among foreign and colonial mines, the greatest amount of business has taken place in *Cobre Copper* shares, which opened at 31*l.*, and at one time went up to 36*l.*-36½*l.*, but close flatter at 34¼*l.* *Cape Copper* shares have been quoted almost daily, and have advanced in price: they close at 7½*l.* *St. John Del Rey* shares have declined from their last quotation of 56*l.*-57¼*l.* At the beginning of the month they were quoted 54¼*l.* x.d., on the 18th 53*l.*, and close 52*l.*-52¼*l.* *Yudanamutana* shares have been quoted at 2½*l.*-2½*l.*-3*l.*, closing at 2½*l.* *Anglo-Mexican Mint*, 18*l.*-18½*l.*-18½*l.* *English and Australian Copper*, 2*l.*-2½*l.* *Nerbudda Coal and Iron*, 5¼*l.* *Nerbudda Coal and Iron (New)*, 2*l.* *Peel River Land and Mineral*, 46*l.* *Neustadt Charcoal Iron*, 1*l.*-1½*l.* prem. *Fortuna*, 4*l.*-4½*l.* *Scottish Australian*, 12*s.* 6*d.* *United Mexican*, 6¼*l.*-6½*l.* *Port Phillip*, 1¼*l.* *Vallanzasca*, 1½*l.* *Pontgibaud*, 6½*l.* *Santa Barbara*, 12*s.* 6*d.* *Otea Copper*, 1½*l.*-1½*l.* prem. *El-Chico Silver*, 15*s.*-25*s.* prem. *Alamillos*, 10*s.*-12*s.* 6*d.* *Don Pedro North Del Rey*, 15*s.*-17*s.* 6*d.* *Kapunda*, 1½*l.* *Bon Accord*, 2*s.* 6*d.*-5*s.* *Capula Silver*, 15*s.*-20*s.* *Montes Aureos*, flat at 2¼*l.*-2½*l.* *East del Rey*, 15*s.* *General*, 21¼*l.*-22*l.* *Norwegian Copper*, 7*s.* 6*d.*-12*s.* 6*d.* prem. *Worthing*, 15*s.*-17*s.* 6*d.* *Linares*, 6½*l.* *Mariquita*, 17*s.* 6*d.* *Vancouver Coal*, 5*l.*

Among new undertakings, *Panulcillo* shares have been quoted at 1¼*l.*-1½*l.* prem.

CORNWALL.—The Cornish share market has been active, with a large business doing at advanced prices; and as there has been a rise in the tin and copper standard, a greater amount of transactions may be expected. There has been a considerable rise in some shares, and prices altogether have been well maintained. *Camborne Veau* shares have been dealt in at 2½*l.*-2½*l.* *Boscawen* shares have improved. *Great North Downs* inquired for at 1¼*l.*-2*l.* *East Lovell* shares have been largely dealt in at 9*l.*-9¼*l.* *Wheal Emily Henrietta*, 7½*l.* *Great Wheal Fortune*, 25*l.*-26*l.* *St. Day United*, 37*s.*-38*s.* 6*d.* *Nanjiles*, 20¼*l.*-31¼*l.*

BIRMINGHAM.—*Muntz's Metal* shares have again receded from our last quotation of 8s. 9d. to 1l. dis.

LEEDS.—*Craven Moor* shares have been firmer, and business has been done in them at 3s.

LIVERPOOL.—*Copiapo and Caldera*, 135l. *Santa Barbara*, 2s. 6d. dis. *Don Pedro North Del Rey*, 6s. 3d. prem.

MANCHESTER.—*Staveley Iron and Coal*, 16s. prem.

NEWCASTLE-ON-TYNE.—*Troed-y-rhiw* shares active. *Chiverton*, and *West Chiverton* shares firm. *Harwood*, nominal at 12s. 6d.-15s. *Tyne Head*, flat.

DUBLIN.—The Irish mining share market has been moderately brisk. *Mining Company of Ireland* shares opened at 20½l., and went up to 22l., but towards the end of the month became flat, and close at 21½l., at which price however they were sought for. *Wicklow Copper* shares have been quoted at 12½l.-13l. *Connorree* shares have been brisk at 20s. 6d.-21s. They opened at 18s. 6d.-19s., so that they have made some improvement during the month. *General*, 4½l. *Carysfort*, 21s.

NEW YORK, January 11th.—The market for mining shares has been fairly active, many inquiries having been made for this class of stock. The principal fluctuations have been as follows—**ADVANCED:** *Cumberland Coal*, \$8; *Lancaster Lead*, \$2; and *Rockland*, \$2. **DECLINED:** *Bohemian*, \$4; *Quicksilver*, \$5; *Knowlton*, \$2. The following are the closing quotations: *American Coal*, \$93-\$95; *Aztec*, \$3½-\$4½; *Bucks Co.*, \$1½-\$1½; *Bohemian*, \$8-\$11; *Caledonia*, \$6½-\$8; *Canada*, \$2½; *Copake Iron*, \$14; *Cumberland Coal*, \$49-\$50½; *Carp Lake*, \$4½-\$5; *Cascade* (asst. paid), \$½-\$½; *Central*, \$56-\$57½; *Columbian*, \$7½-\$8½; *Erie Lead*, \$22; *Evergreen Bluff*, \$9-\$9½; *Everett*, \$2-\$4; *Eureka*, \$1½-\$2½; *Flint Steel River*, \$9½-\$10½; *Franklin*, \$50; *French Creek*, \$2; *Hilton*, \$5½; *Hancock*, \$14; *Hamilton*, \$2½-\$4; *Huron*, \$32-\$36; *Indiana* (asst. paid), \$6-\$6½; *Ile Royal*, \$26-\$27; *Knowlton*, \$8½-\$9½; *Lafayette*, \$14-\$2; *Lancaster Lead*, \$5-\$7½; *Manhattan* (asst. paid), \$6½; *Mandan*, \$3-\$4½; *Minesota*, \$73; *Montana Gold*, \$½-\$1; *New York*, \$3; *N. J. Consolidated*, \$3; *Norwich*, \$6-\$6½; *New York and Nova Scotia Gold*, \$3½; *Ontonagon*, \$3-\$3½; *Ogima*, \$5½-\$5½; *Pewabic*, \$61; *Pittsburgh*, \$85-\$93; *Providence*, \$1½-\$2½; *Placentia Bay*, \$1½-\$1½; *Quartz Hill Gold*, \$10-\$13; *Quicksilver*, \$57-\$59; *Quincy*, \$92-\$98; *Rockland* (asst. paid), \$16-\$19; *Superior*, \$9-\$10; *Teal Lake Iron*, \$5-\$7.

SAN FRANCISCO, December 7th.—Notwithstanding the lack of advices of new discoveries, there has been a very fair amount of business transacted in the mining share market during the past month. Operations have been principally confined to *Ophir*, *Gould and Curry*, *Burning Moscow*, and *Lady Bryan*.

Ophir shares have advanced from our last quotation of \$1,430 to \$1,660. A dividend of \$60 per foot was declared on Dec. 5th. *Gould and Curry* shares have been firmly held at \$4 500. A dividend of \$125 per foot was declared on Dec. 4th, and a large surplus carried over to meet current expenses. *Burning Moscow* continue to be the chief speculative stock. A large number of shares have changed hands, and prices have declined heavily; shares opened at from \$255 to \$300, and close at \$146 to \$180. *Baltic* shares have been considerably dealt in, and prices have advanced from \$70 to \$90. *Lady Bryan* at one time rose into great demand in consequence of reports from the mine that a valuable and heavy vein had been met with, and shares rapidly advanced from \$10 to \$16. No confirmation of the discovery being subsequently received, shares declined to \$11. *Hale and Norcross* have been considerably sought after at \$925; holders firm at \$1,000, but no transactions reported. *Melones* shares have been

in considerable demand, and prices advanced from \$100 to \$110. *Chollar* shares have been freely offered at a decline of \$60, the amount of the last assessment. *Sheba* shares have advanced to \$140. *Uncle Sam* shares have again largely advanced from the opening price \$280 to \$440. *Sanage* shares have been inactive, but prices have been firmly maintained at from \$2,750 to \$2,775. A dividend of \$50 per foot was declared on Dec. 5th, leaving a large balance to be carried over.

METAL MARKETS.

LONDON. *January 28th.*—The activity which characterised the metal market at the beginning of the month has not been quite maintained, although prices been very firm, and holders by no means pressing to effect sales.

IRON.—There are no signs of any decrease in the activity in the iron trade which still continues very brisk.

Although a fair amount of business has been transacted, the Scotch pig iron market has manifested a downward tendency all through the month. Prices opened at 65s. 6d. cash, 67s. 3d. three months, and close at 63s. 3d. cash, 65s. 10½d. three months.

Welsh bars have been very firm at 8l. f.o.b. in Wales, 9l. f.o.b. in London. Staffordshire descriptions have been in great demand at the advance which took place in the middle of the month, makers with difficulty supplying orders. Swedish iron remains unaltered.

STEEL.—Very little business has been done in this article and prices remain unaltered.

COPPER.—The market both for raw and manufactured has been exceedingly active all through the month, and a very large amount of business has been transacted. The smelters advanced the price 5l. per ton on the 1st, and 5l. again on the 15th, making manufactured 120l.; tough cake and tile, 113l.; best selected, 116l. Burra Burra, 115l.; Kapunda, 117l.; Wallaroo, 115l.; Chili, 103l. to 105l.

YELLOW METAL.—This article is quoted at 10½d. per lb. for sheathing; nails, 12½d.

TIN.—This metal was quite neglected at the beginning of the month, but on the 6th the smelters advanced the price 4l. per ton, which caused a considerable improvement in the market. About the middle of the month a considerable business was done in straits, which has advanced to 119l. Banca, 120l.

TIN PLATES have been in good demand at full prices.

LEAD has been very firm and in good demand.

SPELTER.—At the beginning of the month there was great excitement in this article, fully 10,000 tons having changed hands in a fortnight, at from 20l. to 20l. 5s.

GLASGOW. *January 27th.* IRON.—The pig-iron market exhibited considerable briskness at the close of December, but became flat at the beginning of January, and has, on the whole, been quiet all through the month. On the 30th prices opened firm at 69s. 6d. cash, 71s. 3d. three months; No. 1, c.m.b., 68s. 6d.; No. 3, 67s. 9d. On the 31st the market opened very animated, but gradually gave way and closed at lower rates. From January 4th to the 9th, the market was very quiet, and business was done at prices ranging from 64s. to 67s. 9d. From the 9th to the 14th the market was very firm, and prices at one time reached 67s. 3d. cash, 67s. 9d. one month, 69s. three months. From that date the market was again very quiet, prices reaching their lowest quotation of 62s. 9d. on the 25th. On the 27th the market was firm with buyers at 63s. 1½d., sellers 63s. 3d. cash.

PARIS, *January 24th*.—COPPER has been in good demand at greatly advanced prices. English, 272½ fr. ; Lake Superior, 295 to 400 fr. ; Chili, 260 to 262½ fr.

TIN has also advanced. Banca, 315 fr. ; Straits, 310 fr. ; English, 290 fr.

LEAD, French and Spanish, has been quoted at 54 fr.

COLOGNE, *January 18th*.—The metal market has been very active, and prices of most kinds have advanced. This is especially the case with COPPER, which has gone up considerably, in sympathy with the English market. TIN and SPELTER have been in fair demand.

AMSTERDAM, *January 18th*.—COPPER has been held at 61 fl.

TIN has not improved in position, and remains at 72 fl.

BRESLAU, *January 18th*.—SPELTER has been very quiet at 54 thlrs.

HAMBURG, *January 18th*.—A very large business has been done in all kinds of metals, and prices have in most cases advanced.

IRON in bars has been quoted at 6½ to 6¾ mk. Staffordshire descriptions, 7½ to 7¾ mk. ; Swedish, 8½ to 8¾ mk.

COPPER.—The market for this metal has been very active, and a very extensive business has been done.

SPELTER.—A most extensive business has been transacted in this article, and a very large quantity has changed hands during the past month at 12 mk.

HONGKONG, *December 14th*.—IRON.—Sales, 6,100 piculs. Nailrod, \$2.40 to \$2.65 ; hoop, \$3.20 to \$3.40.

LEAD.—Sales about 2,000 piculs, \$6.40 to \$6.50 ; best, \$6.80 to \$6.90.

Furnished by Von Dadelszen and North, 158, Leadenhall Street, London, E.C.

The metal market during the present month has been very animated, but at the close prices of some articles have a slightly downward tendency.

IRON.—Welsh bars are very firm at from 8*l.* to 8*l.* 10*s.* f.o.b. Wales, and at corresponding prices here. Staffordshire bars are in good demand at the recent official advance. The Scotch pig-iron market has been very fluctuating, and prices have declined to 63*s.* cash, and 65*s.* three months open.

COPPER.—Prior to the official advance of 5*l.* per ton, a very large business was done in both foreign and English. Since the advance business is restricted. Second-hand parcels are obtainable under fixed prices. We quote Burra, 115*l.* ; Kapunda, 117*l.* ; Wallaroo, 115*l.* ; Chili, 103*l.* to 105*l.*

TIN, which during the early part of the month was in little demand, since the recent advance in prices, has been more enquired for. We quote Straits, 118*l.* cash, 120*l.* three months ; Banca, 120*l.* The Dutch market dull at 71 florins.

TIN PLATES are in good demand. Makers held a trade meeting at Gloucester on the 26th inst. and agreed to advance price 2*s.* per box.

LEAD very firm and in good demand.

SPELTER.—There has been a very excited market in this article during the present month, sellers are now hardly to be found at 21¼ 2*s.* 6*d.* to 21*l.* 5*s.*, on the spot, but for February delivery there are sellers at 21*l.* ; March, 20*l.* 15*s.* Hull spelter held for 20*l.* 15*s.*, but not wanted.

LONDON PRICES CURRENT OF METALS.

From Messrs. JAMES and SHAKESPEARE'S, 10, Austin Friars, E.C., 28th Jan.

		Per Ton.	
IRON	{ Rails in Wales ..	£8 0 0	@ £8 5 0
Welch	{ Bars " ..	8 5 0	" 8 10 0
	{ "	—	" 9 0 0
	{ "	10 2 6	" 10 10 0
Staffordshire	{ Nail Rods	10 2 6	" 10 10 0
	{ Hoops	11 0 0	" 11 10 0
	{ Sheets	12 0 0	" 12 10 0
Scotch	Pig (mixed Nos. warrants) in the Clyde	8 4 8	" 3 4 6
Swedish	{ Iron { Large sizes	—	" 12 0 0
Hammered	{ Indian assortments ..	12 10 0	" 13 0 0
	{ Faggot	17 0 0	" 17 10 0
	{ Steel { In kegs ($\frac{1}{4}$ and $\frac{1}{2}$ in.) ..	—	" 16 0 0
		Per Unit.	
COPPER	Ore	20s. 6d.	@ 21s.
	Regulus	—	" 21s.
	Barilla	21s. 6d.	" 22s.
		Per Ton.	
	Chili Slab (for 96% pure Copper)	—	none —
	Spanish Cake	104 0 0	@ £105 0 0
	Burra and P.C.C.	—	" 115 0 0
Australian ..	{ Kapunda	115 0 0	" 117 0 0
	{ Wallaroo	—	" 115 0 0
American....	{ Baltimore	—	" none —
	{ Lake Superior	—	" none —
	{ Tough Cake and Ingot and Tile	—	@ 113 0 0
English	{ Best selected Ingot	—	" 116 0 0
	{ Sheets, Sheathing and Rod	—	" 120 0 0
	{ Flat Bottoms	—	" 125 0 0
		Per lb.	
YELLOW METAL..	Sheets	9½d.	@ 10d.
	Sheathing and Rod	10½d.	" 10½d.
		Per Cwt.	
TIN	{ Common Blocks and Ingots	115s.	@ 116s.
English ..	{ " Bars (in barrels)	116s.	" 117s.
	{ Refined	—	" 121s.
	{ Straits, Fine	117s.	" 118s.
Foreign ..	{ " (with 3 months' prompt)	120s.	" 123s.
	{ Banca	120s.	" 122s.
		Per Box.	
TIN PLATES	Charcoal IC, best	30s. 6d.	@ 31s. 0d.
	" IX "	36s. 6d.	" 37s. 0d.
	Coke IC	25s. 6d.	" 26s. 6d.
	" IX	31s. 6d.	" 32s. 6d.
		Per Ton.	
LEAD	{ Sheet	—	@ £21 15 0
English ..	{ Pig—W.B.	—	" 22 0 0
	{ " Other good brands	£21 7 6	" 21 10 0
	{ " German and Spanish, soft ..	—	" 20 15 0
	{ Red	—	" 22 0 0
English ..	{ Shot	—	" 23 0 0
	{ Dry White	—	" 26 0 0
SPELTER	(Silesian) in Cakes	—	" 21 0 0
ZINC	(Sheet) No. 9 and upwards	26 10 0	" 27 0 0
		Per Bottle.	
QUICKSILVER	(in bottles containing 75lbs. each)	7 15 0	@ 8 0 0
		Per Ton.	
REGULUS OF ANTIMONY, French Star		—	@ 38 0 0

Tabular Abstract of Mining Accounts for the Month.

Date of Account	Name of Mine, and Number of Shares.	Balances.		Calls.		Dividends.	
		Debit.	Credit.	Per Share.	Total.	Per Share.	Total.
CORNISH & DEVON MINES.							
Dec. 16	Wheal Margery (968)	—	—	0 18 0	871 4 0	—	—
" 21	South Crofty (937).....	784 10 5	—	0 15 0	702 15 0	—	—
" 23	Wheal Reeth (240)....	254 5 9	—	—	—	—	—
" 23	Rosewall Hill and Ransom (6,000)	—	5 0 1	—	—	—	—
" 28	East Pool (128)	—	676 13 11	—	—	5 0 0	640 0
" 28	Pendeen Consols (5,000)	761 18 4	—	—	—	—	—
" 29	Hingston Down (6,000)	—	168 0 0	0 1 0	300 0 0	—	—
" 29	New Cornish (12,000)	—	0 19 1	0 5 0	3,000 0 0	—	—
" 29	Great Retallack (6,000).....	182 15 2	—	0 1 0	300 0 0	—	—
" 30	Great Grylls (3,072)	—	2,104 0 0	—	—	—	—
" 30	Wheal Grylls (1,024).....	—	1,044 0 0	—	—	—	—
" 30	East Grylls (2,048).....	—	704 0 0	—	—	—	—
" 30	Wheal Arthur (3,990)	—	222 4 1	0 1 6	449 5 0	—	—
" 30	Furze Hill Wood (6,000)	308 13 0	—	0 1 0	300 0 0	—	—
" 30	St. Aubyn and Grylls ()	—	214 10 0	—	—	0 5 5	—
Jan. 4	South Frances (496)	—	775 15 3	—	—	—	—
" 5	Wheal Jane (512)	—	336 14 8	—	—	—	—
" 5	West Fowey (6,400)	—	556 16 7	—	—	—	—
" 5	Prideaux Wood ()	—	332 0 0	—	—	—	—
" 5	New Pembroke (6,400)	70 18 10	—	0 2 6	800 0 0	—	—
" 6	East Cardon (6,144)	—	7,222 17 5	—	—	0 19 0	5,836 16 0
" 6	Marke Valley (9,000).....	—	807 12 6	—	—	0 1 6	675 0 0
" 6	Carn Camborne (6,000)	402 2 10	—	0 5 0	1,500 0 0	—	—
" 6	West Rose Down (1,000)	—	157 19 3	0 15 0	750 0 0	—	—
" 6	Wheal Kitty (Lelant) (1,024)	—	415 0 0	—	—	0 7 6	334 0 0
" 7	Trencrom (1,024)	933 0 0	—	0 10 0	512 0 0	—	—
" 8	Brigan (5,000)	2,386 12 8	—	0 10 0	3,500 0 0	—	—
" 8	Great North Downs (5,000).....	2,084 6 8	—	0 8 0	2,000 0 0	—	—
" 11	East Falmouth (2,048)	108 5 10	—	0 5 0	512 0 0	—	—
" 12	Bedford United (4,000)	—	457 12 6	—	—	0 2 0	400 0 0
" 12	North Roskear (700)	1,405 10 3	—	2 0 0	1,400 0 0	—	—
" 12	Grambler & St. Aubyn (486)	339 18 2	—	1 0 0	486 0 0	—	—
" 12	North Dolcoath (5,000).....	400 0 0	—	0 3 0	750 0 0	—	—
" 12	Treweatha (4,096)	1,100 0 0	—	0 3 0	611 8 0	—	—
" 12	Treloweth (5,000)	2,361 0 0	—	0 10 0	2,500 0 0	—	—
" 12	Roskearnoweth (700)	56 10 11	—	0 10 0	350 0 0	—	—
" 12	Nanjiles (1,024)	1,683 18 7	—	1 10 0	1,536 0 0	—	—
" 12	Penhalls (5,000)	3,133 7 5	—	0 5 0	1,025 0 0	—	—
" 12	Wheal Buller (56)	1,082 11 8	—	5 0 0	1,280 0 0	—	—
" 13	North Shepherds (2,000)	—	919 1 0	—	—	—	—
" 13	Cook's Kitchen (2,450)	—	237 0 0	—	—	—	—
" 15	Silver Vein (15,000)	—	—	0 2 6	1,875 0 0	—	—
" 15	Boscawen (6,000)	2,034 0 0	—	0 8 0	2,400 0 0	—	—
" 18	West Damsel (256)	—	354 0 0	—	—	1 0 0	256 0 0
" 18	Emily Henrietta (1,024)	8 15 10	—	0 10 0	512 0 0	—	—
" 19	Wheal Pollard (6,000)	418 16 2	—	0 1 6	450 0 0	—	—
" 20	South Herodsfoot (1,024)	237 11 11	—	0 10 0	512 0 0	—	—
" 20	Wheal Hearle (4,096)	—	238 17 4	—	—	—	—
" 22	Devon Great Consols (1,024)	—	33,006 18 10	—	—	10 0 0	10,240 0 0
" 23	Wheal Kitty (St. Agnes) (1,295)	—	1,880 0 0	—	—	0 5 0	1,073 15 0
" 28	East Gunnislake and South Bedford (1,000)	—	416 6 6	0 2 0	400 0 0	—	—
" 28	Wheal Hope (2,048)	—	107 1 2	0 5 0	512 0 0	—	—
WELSH & OTHER MINES.							
Dec. 18	Cwm Erfin (367)	—	—	—	—	0 15 0	650 0 0
Jan. 8	Vale of Towy (20,000)	45 0 0	—	—	—	—	—
" 14	Tyne Head (6,400)	—	28 15 7	0 1 0	320 0 0	—	—
" 15	Diphwys Casson ()	—	2,114 13 8	—	—	—	—
FOREIGN MINES.							
Jan. 6	Kapunda (68,000)	—	—	—	—	0 1 0	3,400 0 0
" 18	Beatrix (20,000)	—	2,876 15 0	—	—	—	—
" 19	Port Phillip (100,000)	—	—	—	—	0 1 6	75,000 0 0
" 20	Great Northern (80,000)	—	3,373 11 8	—	—	—	—

Copper Ores.

Sampled Dec. 14, and sold at Tab's Head, Bideford, Dec. 31, 1893.

Mine.	Tons.	Pur- chases.	Price.	Mine.	Tons.	Pur- chases.	Price.
Clifford Amalgamated	36	6	£3 13 6	East Pool	77	8, 13	£4 13 6
45	1, 6	3 13 6		65	5	5 4 6	
44	3, 3	4 13 6		63	7	5 1 6	
46	1, 6	5 8 1		62	7	2 11 0	
74	1, 5	16 4 6		60	6	5 3 0	
56	1	2 11 6		38	12	2 1 6	
57	5	6 22 1		35	1, 6	4 12 6	
55	8	12 11 6		34	7	3 16 0	
48	1, 3	12 11 0		South Frances	45	6	7 6 6
35	5	4 13 6		40	2	6 13 0	
33	6	5 3 6		34	13	7 3 6	
Powey Consols	51	1, 6	7 6 6	31	9	6 13 0	
74	1, 5, 6	10 6 6		55	1	5 8 6	
73	1, 5	3 16 6		53	7	5 6 6	
64	10	4 7 0		33	3	14 9 0	
60	1, 5	5 12 6		North Roskear	37	7, 10	2 7 6
35	1, 5	5 17 6		30	13	9 0 0	
West Beton	54	11	4 13 6	22	7	7 16 0	
76	11	5 9 0		(Pendarves)	36	7, 10	4 8 6
63	8, 9, 13	5 3 0		New Treleigh	65	7	2 18 0
52	9	6 15 0		46	7	4 4 0	
49	9	2 15 6		East Wheal Bassett	41	13	6 2 6
40	9	7 15 0		30	1, 6	7 3 6	
Wheal Beton	16	2, 12	1 11 0	25	3	11 12 6	
(Pendarves)	107	3	5 0 0	Wheal Harriett	51	12	5 4 6
100	2, 3	7 4 6		44	1	2 19 6	
52	7	8 17 0		52	12	1 6 6	
18	3	15 3 6		36	6	6 5 0	
5	1	3 4 6		West Stray Park	38	7	10 19 0
South Tolgus	52	3	7 15 0	15	7	3 14 0	
51	9	4 12 6		Carn Camborne	17	3	4 1 0
42	1	8 10 6		7	1	8 10 6	
40	2, 6	6 12 6		South Bassett	21	12	4 12 6
38	2	7 10 0					

TOTAL PRODUCE AND VALUE.

	Tons.	Amount.		Tons.	Amount.
Clifford Amalgamated	710	£4,008 17 6	North Roskear	125	£667 6 6
Powey Consols	390	2,621 15 0	New Treleigh	111	381 14 0
West Beton	364	1,928 8 6	East Wheal Bassett	96	757 0 0
Wheal Beton	298	2,085 15 6	Wheal Harriett	95	397 7 6
South Tolgus	223	1,546 18 6	North Crofty	88	293 18 0
East Pool	205	1,019 6 6	West Stray Park	53	471 12 0
Tolvorne	187	678 17 0	Carn Camborne	24	128 10 6
South Frances	150	1,046 10 0	South Bassett	21	97 2 6
Wheal Bassett	141	1,057 9 0			

EACH COMPANY'S PURCHASE.

	Tons.	Amount.		Tons.	Amount.
1 Vivian and Sons	496½	£3,129 18 5	9 Copper Miners' Co.	244	£1,347 18 6
2 Freeman and Co.	191½	1,181 18 5	10 Charles Lambert	100½	401 19 9
3 Grenfell and Sons	406	3,127 2 6	11 Newton, Keates & Co.	160	806 18 0
4 Crown Copper Co.	—	—	12 Sweetland, Tuttle & Co.	168	519 12 0
5 Sims, Wilyams & Co.	270½	1,852 0 11	13 Penclawdd Copper Co.	164½	1,053 4 3
6 Williams, Foster & Co.	456½	2,808 10 3			
7 Mason and Elkington	486½	2,425 9 9	Total	3,281	£19,788 7 0
8 Bankart and Sons	166½	1,133 14 3			

Average Produce, 6½.
Quantity of Fine Copper, 225 tons 2 cwt.Average Standard£128 0 0
Average Price per ton 6 0 6

Copper Ores.

Sampled Dec. 23, 1863, and sold at Tabb's Hotel, Redruth, Jan. 7, 1864.

Mines.	Tons.	Pur- chasers.	Price.	Mines.	Tons.	Pur- chasers.	Price.
West Basset	62	3, 6	£5 13 6	East Rosewarne	18	12	£2 18 6
	61	9	7 0 6	Par Consols	55	7	7 5 6
	60	2, 6	4 2 6		54	2	8 12 0
	59	7	10 15 0	Tolvadden	44	6	4 1 6
	49	8, 13	3 15 6		35	8	5 14 6
	45	11	5 0 6		20	11	6 18 0
	34	1	5 12 6		9	1	13 6 6
East Carn Brea	23	10	5 0 6	Copper Hill	35	3, 10	6 4 0
	66	7	4 15 0		33	12	1 8 6
	55	8, 13	3 18 0		32	1, 10	2 1 6
	51	11	6 14 6	North Basset.....	29	11	5 13 0
	29	7	5 3 0		23	6, 9	5 5 0
	28	8, 13	5 4 6	Wheal Buller.....	36	7	4 6 6
	27	7	3 3 6	North Frances	25	1, 3, 6	5 15 6
Prosper United.....	60	1	2 13 6		11	12	1 4 6
	63	5	5 14 0	Gurlyn	25	1, 6	6 18 6
	62	1, 6	3 18 6	Emily Henrietta	23	10	6 8 6
	45	5	6 4 0	South Crenver ...	17	9	2 17 6
Wheal Margery	69	1	2 15 6		5	6	10 18 0
	66	6	2 8 0	West Trevelyan	22	8	6 12 6
	56	1, 6	8 8 6	Wheal Curtis.....	22	1	5 5 6
	5	1	4 8 0	South Carn Brea	19	10	3 11 0
East Rosewarne	40	13	8 12 6	South Buller.....	15	3, 6	5 4 0
	37	2	8 5 0	Crowan Consols	12	1	4 0 0
	24	6	13 13 0				

TOTAL PRODUCE AND VALUE.

	Tons.	Amount.		Tons.	Amount.
West Basset	393	£2,380 1 0	North Frances	36	£157 17 0
East Carn Brea	256	1,252 7 0	Gurlyn	25	170 12 6
Prosper United	250	1,095 9 0	Emily Henrietta	23	147 15 6
Wheal Margery	196	843 16 6	South Crenver	22	102 17 6
East Rosewarne	119	1,030 10 0	West Trevelyan	22	145 15 0
Par Consols	109	864 10 6	Wheal Curtis	22	116 1 0
Tolvadden.....	108	642 2 0	South Carn Brea	19	67 9 0
Copper Hill	100	830 8 6	South Buller.....	15	78 0 0
North Basset	52	284 12 0	Crowan Consols	12	48 0 0
Wheal Buller	36	155 14 0			

EACH COMPANY'S PURCHASE.

	Tons.	Amount.		Tons.	Amount.
1 Vivian and Sons	326½	£1,431 8 3	9 Copper Miners' Co. ...	85½	£517 13 0
2 Freeman and Co.	121	893 8 0	10 Charles Lambert.....	98½	472 10 0
3 Grenfell and Sons	64½	371 11 0	11 Newton, Keates & Co. ...	145	870 19 0
4 Crown Copper Co.	—	—	12 Sweetland, Tuttle & Co. ...	62	113 3 0
5 Sims, Wilyams & Co. ...	108	638 2 0	13 Fenclawdd Copper Co. ...	106	617 17 9
6 Williams, Foster & Co. ...	302½	1,629 9 9			
7 Mason and Elkington ...	272	1,788 13 0	Total	1,815	£9,913 15 0
8 Bankart and Sons ...	123	619 0 3			

Average Produce, 6.
Quantity of Fine Copper, 108 tons 7 cwt.Average Standard £136 18 6
Average Price per ton 5 9 0

No Sale on January 14.

Copper Ores.

Sampled Jan. 3, and sold at the Royal Hotel, Truro, Jan. 21.

Mines.	Tons.	Pur- chasers.	Price.	Mines.	Tons.	Pur- chasers.	Price.
Devon Great Consols	141	13	£5 14 0	Hingston Down	70	7	£3 7 6
	138	8	5 15 6		69	8	3 8 6
	137	8	5 4 6		62	7	7 1 0
	134	13	6 12 6		60	1	5 19 6
	132	11	6 18 0	Marke Valley	84	3	3 18 0
	125	8	4 19 0		82	6	3 8 6
	124	9	5 11 0		81	3	4 1 6
	122	7	5 16 0		65	3, 8	4 4 0
	119	12	4 11 6		38	13	5 13 6
	117	5	6 0 0		31	6	3 13 6
	116	6	2 0 6		20	12	2 6 6
	110	1	3 6 0	East Russell	72	8	3 8 6
	108	5	3 15 0		60	2, 8	5 8 0
	107	3	5 11 6		54	7	5 12 6
	101	3	6 8 0		24	2	7 12 0
	94	1	2 14 6		20	7	12 9 0
	89	9	6 4 6	Bedford United	108	2, 6	5 7 6
	71	6	4 16 0		95	6	5 12 6
	41	3	12 12 6	Wheal Edward	73	12	4 6 0
	23	2	10 11 6		51	9	1 15 6
	22	5, 11	6 2 6		39	9	2 19 0
	21	2, 3	12 15 6	Wheal Friendship ...	70	10	3 14 6
	20	5	4 4 6		40	6	11 13 6
	13	5	7 1 0		35	1	10 13 6
	8	5	48 0 0	Holmbush	46	1, 6	10 5 0
New Wheal Martha...	109	1, 5	3 8 6		40	1, 6	10 15 6
	100	1, 5	3 2 6		30	13	6 4 6
	95	1, 5	2 15 6	Wheal Emma	54	1	1 17 6
	92	1, 5	2 1 6		33	5	6 17 0
	87	1, 5	3 1 6		28	9	4 10 6
	80	1, 5	2 8 0	Kelly Bray	65	2	3 18 0
	40	1, 5	1 1 6		30	10	1 11 6
East Caradon	91	2, 7	6 17 6	Lady Bertha	70	8, 12	2 1 6
	89	9	6 12 0	Yarner	69	1	3 7 6
	85	6	6 15 6	Cargoll	45	5	12 15 0
	61	1	9 3 6		15	1	4 4 6
	60	6	10 7 6	Gunnis Lake (Clitt.)	30	3	7 1 6
	58	10	5 18 6	Hawkmoor	28	3, 9, 10, 11	4 10 0
	57	6	10 15 6	Furdon	25	3	4 14 0
Hingston Down	85	7	3 16 0	Collacombe	23	5	3 6 0
	74	7	3 16 0				

TOTAL PRODUCE AND VALUE.

	Tons.	Amount.		Tons.	Amount.
Devon Great Consols.....	2,233	£12,537 16 6	Wheal Emma	115	£454 0 0
New Wheal Martha	603	1,642 17 6	Kelly Bray	95	300 15 0
East Caradon	502	3,934 16 6	Lady Bertha	70	145 5 0
Hingston Down	420	1,872 7 6	Yarner	69	232 17 6
Marke Valley	401	1,687 12 0	Cargoll	60	907 2 6
East Russell	230	1,306 15 0	Gunnis Lake	30	212 5 0
Bedford United	201	1,104 2 6	Hawkmoor	28	126 0 0
Wheal Edward	163	519 9 6	Furdon	25	117 10 0
Wheal Friendship	145	1,101 7 6	Collacombe	23	75 18 0
Holmbush	116	1,089 5 0			

EACH COMPANY'S PURCHASE.

	Tons.	Amount.		Tons.	Amount.
1 Vivian and Sons	842½	£3,581 2 9	9 Copper Miners' Co.	488	£2,542 19 0
2 Freeman and Co.	251	1,672 19 0	10 Charles Lambert	107	339 10 0
3 Grenfell and Sons	519	3,091 2 3	11 Newton, Keates & Co.	150	1,009 13 6
4 Crown Copper Co.	—		12 Sweetland, Tuttle & Co.	247	977 9 0
5 Sims, Williams & Co.	679½	3,701 13 3	13 Penclawdd Copper Co.	343	2,093 17 0
6 Williams, Foster & Co.	778½	4,833 6 9			
7 Mason and Elkington	487	2,637 18 0	Total	5,529	£29,267 2 6
8 Bankart and Sons	638½	2,986 11 6			

Average Produce, 5½.
Quantity of Fine Copper, 308 tons 4 cwt.Average Standard £141 6 0 | Average Price per ton | 5 6 0 |

Copper Ores.

Sampled Dec. 23, 1863, and sold at Swansea, Jan. 12, 1864.

Mines.	Tons.	Pro-duce.	Pur-chasers.	Price.	Mines.	Tons.	Pro-duce.	Pur-chasers.	Price.
Cobre	104	12½	7	£11 8 6	Connorree Ore ...	5	36½	3	£25 5 0
92	12½	5	11 8 6			3	29½	10	28 10 6
43	12½	5	11 6 6		(Precipitate) 8	18	10	17 6 6	
(Regulus) 30	28½	5	27 16 0		(Ore) 49	24	1	3 3 6	
(Mixture) 5	10	2	9 14 0			43	3½	1, 7	3 3 6
37	13½	3	12 19 0		Berehaven	103	9	2, 14	9 14 6
11	18	3	17 5 0		Concordia	14	13½	14	13 3 6
50	18½	3	17 12 0			13	18½	1, 14	19 1 0
(Regulus) 36	29½	6	23 16 0			7	19½	6	19 15 0
84	29½	14	23 10 0		Cape Copper Co. }	26	36½	6	36 18 0
Knockmahon.....	167	11½	13, 14	11 16 6	Spectakel }	5	33½	10	32 15 6
	130	8½	13	8 16 6	Ookip.....	5	33½	10	32 15 6
Connorree Ore ...	74	3½	1	2 13 6	Holyford	2	4½	7	4 5 0

TOTAL PRODUCE AND VALUE.

	Tons.	Amount.		Tons.	Amount.
Cobre	442	£7,163 9 6	Concordia.....	34	£570 7 0
Knockmahon	287	2,999 17 0	Cape Copper Co.	31	1,123 5 6
Connorree Ore	177	903 17 0	Holyford	3	8 10 0
Berehaven	103	1,001 13 6			

EACH COMPANY'S PURCHASE.

	Tons.	Amount.		Tons.	Amount.
1 Copper Miners' Co.	151	£245 12 3	10 Bankart and Sons	11	301 8 6
2 Freeman and Co.....	56½	549 6 9	11 Charles Lambert	—	—
3 Grenfell and Sons	103	1,725 3 0	12 Ravenhead Copper	—	—
4 Crown Copper Co.	—	—	13 Sweetland, Tuttle & Co. 208½	—	2,073 11 0
5 Sims, Williams & Co.	165	2,372 1 6	14 Jennings & Co	184½	2,704 5 3
6 Vivian and Sons	69	2,134 9 0	15 Penclawdd Copper Co.	—	—
7 Williams, Foster & Co.	127½	1,264 19 3			
8 British and For. Copper Co. —	—	—	Total	1,076	£13,670 19 6
9 Mason and Elkington	—	—			

Blende Sales.

Date.	Mine.	Tons.	Price per ton.	Purchasers.	Amount of Money.
Jan. 1.	Miners	90	£ 4 0 6	W. Kenrick	£ 365 10 0
"	"	50	4 7 0	Vivian & Sons	375 0 0
"	"	17	1 14 0	ditto	
"	"	15	4 7 0	ditto	

Sundry Copper Ore Sales.

Dates.	Mines	Tons.	Price per ton.	Purchasers.	Amount of Money.
Jan. 7.	Great Laxey (ex Ruby)...	80	£ 4 11 0	St. Helen's Co.	£ 336 0 0
"	(ex Rebecca)...	114	4 11 0	ditto	488 4 0
" 19.	(Parys Mines) Lot 1. ...	165	7 14 6	Mona	
"	2. ...	65	2 17 6	ditto	2923 0 0
"	3. ...	165	7 14 6	J. Keys & Son	
"	4. ...	65	2 17 6	C. Lambert	
Lot 1. (ex Lejontine) ...	25	12 12 6	Newton, Keates & Co. ...		
"	2. ...	35	10 7 6	J. Keys & Sons	
"	1. (ex G. Bodaracca) 59	10 13 6	Sweetland & Co.		2061 13 0
"	2. ...	41	10 10 0	J. Keys & Sons	
"	1. (ex Ascalon)	11	27 1 6	St. Helen's Co.	

Lead Ore Sales.

Dates.	Mines.	Tons.	Price per Ton.			Purchasers.	Amount of Money.	
			£	s.	d.		£	s. d.
Dec. 23.	Wheal Trelawny	60	27	1	0	Sims, Wilyams & Co.....	2159	11 0
	"	42	12	15	6	R. Michell & Son.....	2055	0 0
" 30.	Great Laxey	100	20	11	0	Sims, Wilyams & Co.....	214	2 6
	Minera Union	15	14	5	6	Jenkins Brothers.....	885	0 0
	Bronfloyd	60	14	15	0	Sims, Wilyams & Co.....		
Jan. 1.	Minera	100	14	11	6	Walker, Parker & Co.....		
	"	100	14	11	6	ditto		
	"	100	14	11	6	ditto		
	"	97	14	11	6	ditto	8486	1 0
	"	100	14	11	6	ditto		
	"	77	14	11	6	ditto		
	"	5	12	0	0	ditto		
	"	5	12	0	0	A. Eyton		
" 4.	East Logylas	60	14	0	6	Walker, Parker & Co.	841	10 0
	Glogfach	70	17	12	0	Sims, Wilyams & Co.....	1232	0 0
	Cwmystwith	70	14	2	0	ditto	1970	10 0
	"	70	14	1	0	Walker, Parker & Co.....		
" 5.	Wheal Mary Ann.....	54	26	14	0	Sims, Wilyams & Co.....	1801	18 0
	"	26	13	17	0	Stock & Co.		
	North Laxey	15	14	14	0	Sims, Wilyams & Co.....	220	10 0
" 14.	Talargoch (Maesyrerwddu) ..	47	15	8	0	A. Eyton	723	16 0
	" (Coetia Liys) ...	654	15	17	6	ditto	1039	16 3
	Deep Level	6	14	1	6	ditto	84	9 0
	Brynford Hall	5	13	17	0	Brymbo Co.	69	5 0
	Parry's	14	14	11	6	Walker, Parker & Co.	204	1 0
	Bryn Gwilog	50	15	5	6	ditto	763	15 0
	Long Rake	15	14	6	6	ditto	214	17 6
	Chware Las	3	14	18	0	A. Eyton	44	14 0
	Speedwell	7	14	2	6	Walker, Parker & Co.....	98	17 6
	Pennant	7	14	4	6	A. Eyton	99	11 6
	Llangnog United	24	14	6	6	Walker, Parker & Co.	343	16 0
	Dyffngwm	6	13	19	0	Newton, Keates & Co.	167	8 0
	"	6	13	19	0	Brymbo Co.		
	Aberdovey	4	13	13	0	Walker, Parker & Co.....	54	12 0
	Nant-y-lago	16	14	1	6	ditto	225	4 0
" 18.	Frongoch	160	13	13	6	Newton, Keates & Co.	2188	0 0
	West Frongoch	40	12	16	0	Panther Co.	512	0 0
	East Darren	75	17	3	6	A. Eyton	1288	2 6
	Cwm Errin	62	17	5	6	R. Michell & Son	1071	1 0

Black Tin Sales.

Dates.	Mines.	Tons c. q. lbs.	Price per ton.			Purchasers.	Amount of Money.	
			£	s.	d.		£	s. d.
Dec. 22.	New Prospidnick	1 14 2	7	63	10 0	—	127	19 8
	"	0 6 3	1	54	0 0	—		
" 23.	Wheal Grenville	5 9 0	27	68	0 0	—	396	11 10
	"	0 12 2	10	40	0 0	—		
	Garlidna United	5 17 2	18	67	0 0	Bissoe Co.	521	3 4
	"	2 16 1	22	45	0 0	ditto	221	4 6
" 24.	Leeds & St. Aubyn	3 8 0	8	65	0 0	Chyandour	290	3 6
	Gurlyn	4 8 1	2	65	15 0	ditto	246	3 3
	Cornubia	3 13 1	26	67	0 0	Daubuz & Co.	965	1 5
" 30.	Great Wheal Busy	16 11 1	12	—	—	—	673	17 10
" 31.	St. Day United	9 18 1	8	—	—	—	554	16 11
	Pedn-an-drea	8 16 3	20	—	—	—	722	6 5
Jan. 2.	Phoenix	11 11 2	12	62	7 6	Bissoe Co.	649	19 10
	Wheal Uny	8 16 2	23	62	5 0	—		
	Prosper United	5 3 3	2	65	15 0	Bolitto & Sons		
	"	1 11 0	21	53	0 0	ditto	960	13 6
	"	7 3 0	7	65	15 0	W. G. & F. M. Williams		
	"	1 2 3	24	58	0 0	ditto		
	North Wheal Jane.....	1 12 2	27	60	10 0	Daubuz & Co.	99	0 10
" 13.	Great Work	11 10 2	22	74	5 0	Redruth Co.	856	9 2
" 16.	Penhalls	3 11 2	6	—	—	—	247	15 1
" 18.	Wheal Par	1 12 3	16	70	15 0	Redruth Co.	116	7 2
	St. Day United	42 19 1	10	—	—	—	2598	5 1

THE

MINING AND SMELTING MAGAZINE.

MARCH, 1864.

The New continuous Jigging Machine of the Harz.*

UNTIL very recently, both the rich and poor ores † of the mines of the Upper Harz, of a size ranging from $\frac{1}{12}$ th to $\frac{1}{2}$ th of an inch, had been dressed by means of the ordinary strake, tye, and buddle; a process which, however simple in itself, consumes an undue proportion of time and labour, and greatly depends, besides, for its effectiveness, on the attention of the attendant.

The appliances used in cleaning the ores by this process are classed into three kinds: 1st, a strake or tye with a rapid stream of water; 2nd, a tye with a medium stream; and 3rd, a finishing-off tye. The ore is first washed in the tye with the rapid stream of water, then twice in the second one, and lastly in the finishing-off tye as many times as may be necessary to clean it up to the required point. For this, four workpeople are required, with weekly wages ranging from 15 ngr. (18d.) to 20 ngr. (2s.). The result of each stage of the process is as follows:—

A. From the first tye.

- (a.) Head of tye, which goes to second tye.
- (b.) Middle of ditto, which is worked over again on this tye.
- (c.) Tail of ditto, which goes to the flat buddles and jigging hutchies.
- (d.) Tailings, which are tyed over again.
- (e.) Slimes, which go to the shaking and sweeping frames.

* *Berg- und Hüttenmännische Zeitung*, No. 1, 1864.

† Lead ores.—Ed. M. & S. M.

B. From the second tye.

1. From the first tyeing.

- (a.) Head of the tye, worked over again on this tye.
- (b.) Middle of ditto, which goes to the first tye.
- (c.) Tail of ditto, which goes to the flat buddle or jigging hutches.
- (d.) Tailings, tyed over again.
- (e.) Slimes.

2. From the second tyeing.

- (a.) Head of tye, which goes to the finishing tye.
- (b.) Tail of ditto.
- (c.) Fine tailings for the fixed frames and jigging hutches.
- (d.) Slimes.

C. From the finishing tye.

Tyeing in the ordinary manner is continued in this, three, four, or six times, until the ore is sufficiently cleaned to be put to pile. The tails of the various tyeings are of various qualities.

For the last two years this process, which caused such an undue consumption of time, has been superseded, with the most satisfactory results for ores of the size mentioned ($\frac{1}{16}$ th to $\frac{1}{8}$ th of an inch), by a continuous jigging machine, worked in the following manner, and drawings of which are shown in Plate II, and the accompanying Fig. 10.

The work to be treated is shovelled into the inclined feeding-hopper *a* in front of the machine, from whence it is gradually carried by the force of the stream of water from the launder *p*, into the perforated trommel *b*. This trommel catches up any twigs or branches, after which the work arrives at the jigging sieve *c*. In the bottom of this a layer of coarse galena is placed from $\frac{1}{8}$ th to $\frac{1}{4}$ th of an inch in size, which acts to a certain extent as a filter, and by checking the flow of the slime enriches the ore before the galena passes through the sieve. The fine ore passes through the sieve *c* into the conical hutch *e*, made of zinc plates, and from this into the bin *e'* when it is ready for the smelting-house (making a produce of 70 to 80 %), if rich ores have been treated, or ready to be washed again on the shaking frame if poorer ores have been treated. The larger grains of galena that cannot pass through the sieve accumulate around the pipe *f*, which can be arranged to any required level, and which is surrounded by a protecting cylinder *g*, which prevents the mixture of the grains of galena. When these grains get to the level of the pipe *f*, they pass through it, by the zinc pipe *h*, into the bin *i* placed under it, and are ready for smelting. The sieve *c* has an inclination of $\frac{1}{2}$ an inch towards the cylinder *f*.

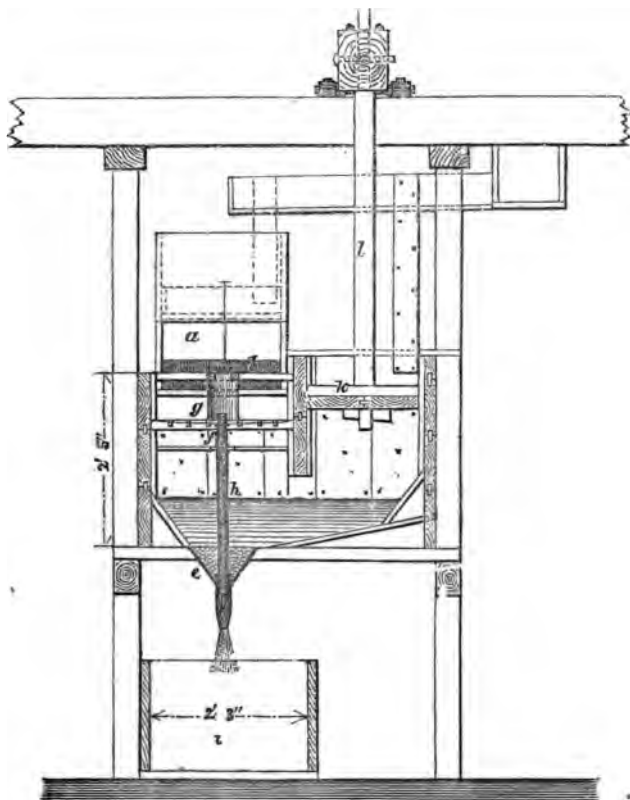
The apparatus is set in motion by the piston *k* connected with the rod *l*. The stroke of the piston is $\frac{3}{4}$ of an inch, and the number of strokes per minute 140. In front of the apparatus is the launder *m*, furnished with ledges 2' long and 4" high, into which the lighter waste is carried, by the stream of water forced up by the piston, through the openings in the side of the top of the hutch; from

whence they pass to a fixed frame or flat buddle. The fine rich slime which deposits on the bottom of the launder is again washed.

With this jigging machine from 15 to 30 tonnen, of 7 cubic feet each (6 cubic feet, English), of work can be treated in twelve hours, producing 7 centner 86 lbs. (about $7\frac{3}{4}$ cwts.) of ore of from 75 to 80% produce, and 3 centner 69 lbs. (about $3\frac{1}{4}$ cwts.) of ore of from 65 to 70% produce. For working this quantity two workpeople are necessary.

FIG 10.

TRANSVERSE SECTION OF JIGGING MACHINE.



The System of Selling Tin-Ore in Cornwall.

THE article which appeared in our January number on this subject has attracted much interest and given rise to considerable discussion in Cornwall. We give below extracts from some of the principal letters that have appeared in the *West Briton*, on which we shall just make a few observations.

With regard to the letter of "H," who makes up for the pettiness of his objection by his tremendous use of small capitals, we beg to inform him that we were perfectly aware of what he states. Our object in referring to the coinage arrangements and tin bills was to show how the present system originated—a system so anomalous as to be incomprehensible without such explanation. We never pretended to give a detailed history of the Cornish tin trade in a short article of five pages, and only dwelt on those features that illustrated our views.

The letter of a "Wendron Purser" is valuable as showing how the present system actually works. As the *Mining Journal* has remarked in an article on this subject, "upon less reliable authority than that of 'A Wendron Purser' we should have been almost disposed to doubt the possibility of such an execrable system of doing business existing in any civilised community."

We quite agree with "One conversant with the Tin Trade," that the new companies have done more harm than good. Indeed under a sound system it is very doubtful if such companies would ever have come into existence: they owe their origin almost entirely to the present unhealthy state of things, which makes it the first necessity of a tin-smelter to be mixed up with tin-mines, and in a position to influence the agents to bring tin to his house. But it is evident that a set of men may have this influence, and yet be very unfit to be smelters. The qualities that make a firm successful as smelters are—superior metallurgical knowledge, and experience and connection in the commercial branches of their business. People who possess neither of these qualifications—however successful they may be in all the arts that gain a supply of tin from Cornish mines—are obviously very likely to be more injurious than otherwise to the trade. Of course if such firms had to buy at a ticketing they would soon find their level; whereas at present by underselling—the necessary consequence of their want of commercial connection and experience—they drag down prices to the level of their incapacity. In time they will no doubt probably learn their business; but it is rather hard that this should be effected at the expense of the tin-miner.

As to the last quoted letter from "One interested in Tin Mines," our readers may remember that we specially stated that we were "not particularly wedded to a ticketing;" and referred to the system of private tender, now so general in the sale of lead ores, as one that might possibly be found preferable. But this is a mere matter of detail; the *principle* we contend for is that there should

be a fair competition, either by ticketing or tender. We may remark, however, that copper ore has frequently been withdrawn from sale at the ticketings.

It must be quite understood that we object to the present system quite as much in the interest of the smelter as in that of the miner. Our position is that it is injurious to the latter, without being beneficial to the former—that is always supposing that no undue advantages are taken. We believe that smelters up to their work—metallurgically and commercially—would be benefited by a system of open purchase, by which they would be freed from the mass of worry now to be gone through to get tin brought to their houses. We are quite satisfied that if Messrs. Vivian and Sons, or any other of the great copper firms, had, at this moment, the option given them of establishing a similar system in the purchase of copper ores, with the same necessities as to holding shares, &c., &c., that are well understood in Cornwall, they would unhesitatingly decline it. No doubt those smelters who are not up to their work—but still, by possessing influence over the mining agents, manage at present to get tin for less money than other men, knowing their business better, could afford to give at an open competition—would be sufferers; but the sooner such firms disappear the better.

SALE OF TIN ORE AND COINAGE OF TIN.

To the Editor of the *West Briton*.

SIR,—If the ingenious writer of a clever paper on "*the system of selling tin ore in Cornwall*," reprinted in your last from the *Mining and Smelting Magazine* of this month, had enquired, he would have found scores, if not hundreds, of persons capable of informing him, not only that the Smelters of Tin ore had ceased to work for hire, and that the *Tin Bill* was obsolete,—but THAT THE (black tin) ORE FROM MOST OF, IF NOT FROM ALL, THE PRINCIPAL TIN-MINES WAS SOLD BY PUBLIC TICKETING A GREAT MANY YEARS BEFORE THE COINAGE WAS ABOLISHED (in 1838).

* * * * *

I remain, Sir,

Your most obedient Servant,

H.

THE SYSTEM OF SELLING TIN ORES IN CORNWALL.

To the Editor of the *West Briton*.

SIR,—I entirely agree with the author of the article on the "System of selling tin ores in Cornwall," in the *Mining and Smelting Magazine*, which appeared in the *West Briton* of last week, and think you will do the county great benefit by advocating an alteration.

* * * * *

A purser or captain now takes 20 tons of tin ore to a distant smelting house without knowing that the smelter requires the particular class of ore raised in his mine, and he is dependant on the purchasers's assay for the price he may receive.

True, he may have assayed the parcel previously, and there is often a friendly collision, or more frequently an abject appeal for "a better price," but if the wind blow cold, or the smelter be at all troubled with bile, there is no redress.

It is absurd to urge that the agent may, if dissatisfied, as he often is, take his ore to another house. After waiting many hours with ten or fifteen carts, he can scarcely drive at night to another house, and if he does, the telegraph or a

special messenger will precede him, and he will meet with a civil reception indeed, but no better price, whilst the carriage will be greatly increased, probably doubled.

I once left a parcel of ores at a smelting house for two days, being satisfied the price offered was inadequate; but after trying other "houses," I was compelled to give in, and was obliged to accept the original standard,—my excellent friend at the smelting house telling the captain he was lucky to get that—comforting the latter by an assurance that his principals would give the best price for his next parcel!

* * * * *

The highest price realized in my experience for tin ores has been by public ticket, and I believe the leading smelters would approve of its general adoption.

At present every reduction in the price of white tin falls on the unfortunate miner, though such reduction may be capricious and unnecessary—the whim of an individual, or the result of underselling. There is rarely any fair analogy between the price of the raw and manufactured article. How is this? If you ask a patriarchal smelter, he shakes his head and says, "'tis all owing to the new men," but if you charge one of the latter, though he may possess a ruddy openness of countenance and the sagacity of a North Briton, he will shake his head too, but say, "all the fault rests with the old hands."

* * * * *

A WENDRON PURSER.

THE METHOD OF SELLING BLACK TIN.

To the Editor of the *West Briton*.

SIR,—Seeing your *West Briton* paper every week I have not failed to notice the different communications on the subject of the mode of selling black tin in Cornwall.

The *Mining and Smelting Magazine* drew public attention to the anomaly of the tin smelters fixing the standard themselves at which they should take the black tin, and advocated the selling it by public ticketing. The *West Briton* quoted the opinions expressed in the magazine: since which the latter published a long article detailing the history of the tin trade, and stating facts on facts, proving the manifest necessity of a change from a monopoly to an open market. The remarks as to the difference in the tickets at the copper ore ticketings, shewing that some companies required particular parcels, for which they could give an extra price, must convince every well-wisher to tin mining, and every other person, except those whose interest it is not to be convinced.

I attribute the late advances in the tin standard mainly to the agitation for a change.

So far there cannot be a doubt that the new companies have done more harm than good, inasmuch as their under-selling the large smelters in the sale of white tin has been the cause of successive reductions; and which under-selling is accounted for from the new smelters being satisfied with 4*l.* or 5*l.* a ton less profit than the old established firms. There can be no doubt that tin ought to have been pounds a ton higher for years past.

I am, Sir, your obedient servant,

ONE CONVERSANT WITH THE TIN TRADE.

THE TIN TRADE.

To the Editor of the *West Briton*.

SIR,—You have lately published some valuable letters on the Tin Trade^a which I happen to know have excited considerable interest in London, Liverpool, and other places where this metal is largely dealt in.

One of your correspondents, "A Wendron Purser," advises that all tin ore should be sold by ticket. Much, no doubt, could be said in favour of this mode, and I am inclined to think it would, at any rate, be an improvement on the present system, viz.:—that of selling the ore to a few favoured purchasers.

There is, however, one great objection to selling tin by ticket, and that is, *you are bound to sell to the party offering the highest ticket, and have no power to say no!* This is the inherent defect in all ticketings. Does any man ever sell his property by such a method? Would any man in his senses call an auction, or offer his property by private contract, and in the first place bind himself down to the highest bidder, or in the second bind himself to accept the highest tender? Are not the men who sell copper ores, lead ores, &c., the *only* persons who sell their property in such a manner? The tinner has now the power to remove his tin from the smelting house if he does not consider the price offered an adequate one; but if offered by ticket he would be bound to sell.

The Tin Trade is, so far as the Cornish ores are concerned, in the hands of eight companies. A few years since there were four only. Let me, for the information of your readers, recapitulate them:—Bolitho and Co.; Williams and Co.; Daubuz and Co.; Enthoven and Co. (Charlestown); Tregoning and Co. (Bissoe); R. R. Michell and Co.; the Redruth Company; and Gatley and Co. As the "*Wendron Purser*" states, some of the most honourable men in the county are connected with this business; but tin smelters are but mortals, and nothing is easier than for them to raise or lower the price at their discretion. Ought not the mines to have the right of rejecting the tender if the price were considered not up to the mark?

I have no doubt the ventilation of this subject in your valuable columns will be of great service, and that an improved system of selling tin will be brought about; but I confess I do not think the matter is yet ripe.

At the present moment we can hardly hope that the tin standard can be obtained at your last quotations, unless the price of metal should advance. Five pounds a ton margin only between buyer and seller can never pay.

I am, Sir, your obedient servant,

ONE INTERESTED IN TIN MINES.

Goguel's Moveable Hearth for Blast-Furnaces.

To obviate the recognised inconveniences arising from the necessity of frequently putting iron-furnaces out of blast, in order to effect necessary repairs in the hearth, M. Goguel (*Génie Industrielle*, 1863, xxvi, 36) proposes an arrangement by which the lower part of the furnace is to be made moveable, so that it can be quickly replaced when required with but a trifling interruption of the working.

The arrangement he proposes is shown in the accompanying Fig. 11, and consists of two essentially distinct parts—a fixed part, and a moveable part; the former comprising the body* with the upper portion of the boshes, and the latter forming the lower portion of the boshes with the hearth.

The fixed part consists of the wall of the furnace A built on the cast-iron rings B; a cast-iron cylinder, C, with the two cornices *m* and *n*, one of which (*n*) supports the cylinder by resting on the ring B, while the other (*m*) supports the flat water-block D, through which a continuous flow of water is maintained for the purpose of cooling the junction between the moveable and immoveable parts of the furnace. E, which is the upper continuation of the boshes, is immoveable, and, like the cylinder C, has a number of openings F

* The lower portion of which only is shown in the figure.

to wrought iron according to Tunner) are found to be very variable in composition, as shown by the following analyses :—

		From Rothehütte. By Rammelsberg.	From Lauchhammer. By Rammelsberg.	From Gleiwitz. By Gurlt.	From Lölling. By Richter.
Graphite		2.604	2.519	2.84	2.122
Carbon		0.201	0.373	2.46	0.967
Silicon		1.896	1.148	0.26	0.972
Phosphorus		0.065	0.406	?	0.021
Sulphur		0.069	0.043	?	0.008
Arsenic		—	—	—	0.006
Atomic ratio		1 : 19	1 : 21	1 : 8	12.5

Therefore there are generally more than 9 atoms of iron to 1 atom of carbon (silicon, phosphorus).

It will thus be seen that white as well as grey pig-iron may crystallise under favourable circumstances, without the formation of the crystals being disturbed by the embedded graphite. The variation in the composition of the crystals, shown by the above analyses—taking place without any alteration in the crystalline form—can only be accounted for by the isomorphism of the elements; and according to Rammelsberg such is the only possible explanation of the constitution of pig-iron. As all the essential constituents of pig-iron—such as iron, silicon, phosphorus, and carbon (as diamond)—crystallise on the regular system, and are consequently all isomorphous, we may consider pig-iron as an isomorphous mixture of its constituents, which will explain the variation of its composition.

There are many examples of metals belonging to the regular system which form alloys that again crystallise on the same system; but there are also many alloys which crystallise on this system, whose constituent metals belong to distinct crystalline systems. On the other hand metals that crystallise on the regular system form alloys crystallising on a different system; thus, for example, silver, zinc, nickel, and copper (iron), alloyed with antimony, crystallise on the pyramidal system. If therefore Spiegeleisen is pyramidal, as is probably the case, it belongs to this class of isomorphous mixtures; and the difference of form in grey and white pig-iron results from the hetro-morphism of their isomorphous constituents. This hetro-morphism is evidently a general characteristic of the elements, being just as marked in the metals as in sulphur and carbon. Doubtless the rhombohedric metals—Sb, As, Fe, Bi, Zn, Pd, Ir, and Rd—and the tetragonal Sn, isomorphous to Bo, may, under certain circumstances, crystallise on the regular system; while Au, Ag, Cu, Pb, &c., and also Sn, may be rhombohedric.

Zierbogel's Method of Extracting Silber.

BY R. WAGNER.*

(Concluded from page 80.)

II. LIXIVIATION, AND FORMATION OF THE SILVER PRECIPITATE.

—The lixiviating apparatus consists—of a reservoir for receiving the solution; of a vessel for heating the water; of lixiviating vats; of settling or clearing tanks; of precipitating vats; and of a pumping reservoir with its apparatus for raising the solution. These are arranged in terraces over each other, so that the solution may pass readily from one to the other.

The reservoir for receiving the solution is of wood, sheet-copper, or lead, and is separated into two compartments, each of which has an opening that can be closed up; so that the operation may not be interrupted if a portion of the reservoir should require cleaning or repairing. It has a capacity of 500 Hanoverian cubic feet (450 cubic feet English); and leaden pipes extend from the bottom of it for the purpose of conveying fresh solution into the lixiviating vats, communicating with each of the latter by a vertical pipe with a tap.

The vessel for heating the water has a capacity of from 200 to 300 cubic feet Hanoverian (173 to 260 cubic feet English). It is heated by a worm pipe supplied with steam from the boiler, which has two pipes—one, near the bottom, leading to the lixiviating vats, and the other to the reservoir for receiving the solution.

The lixiviating vats, which are $26\frac{1}{2}$ " high, are nearly cylindrical in form, having a diameter of $27\frac{1}{2}$ " at the top (including the thickness of the sides $1\frac{1}{2}$ "') and $25\frac{1}{2}$ " at the bottom. Each vat has a double bottom—the upper one being perforated and serving as a filter. This perforated filter, which is 19" down, is made up of two parts;—the under part, a perforated wooden disc 23" in diameter, exactly fitting into the vat, with $\frac{1}{2}$ " holes bored 1" apart, through both the planks and the cross-pieces that hold them together and tightly packed with tow; and the upper part, of basket-work, with a linen disc covering 25" in diameter. There is 2" of space from the bottom of this filter to the bottom of the vat, in which space there is a tap at the side. Ten such vats are in constant work, and are ranged in a row on the top terrace. The taps from these vats discharge themselves into a wooden funnel which conveys the solution into the settling tanks.

The settling or clearing apparatus consists of a rectangular tank, partitioned lengthways into two compartments held together by an iron frame-work, which can be tightened from time to time by wedges. An opening along the partition, lengthways, allows the clear solution to pass after settling from the back into the front compartment, from which it passes through a tap into the silver precipitating vats on the second and third terraces.

* From the *Chem. techn. Jahresber.*, vii. Jahrg.

The precipitating vats are arranged similarly to the lixiviating vats, only smaller. The height is 23", and the greatest diameter is 23"; space between the two bottoms $1\frac{1}{2}$ ". From the taps of the vats on the third stage the solution passes directly into the vats of the fourth, from which the almost desilverised solution passes into the pumping reservoir, out of which it is raised by machinery to be again passed through the lixiviating vats. In the vats of the third terrace there is scarcely any silver, and beautiful crystals of gypsum are found to form on the pieces of copper and on the sides of the vats.

The pumping reservoir is formed of a wooden tank placed in a brick cistern; the space between the tank and the cistern being compactly packed up with clay, brick-dust, burnt lime, or gypsum, so as to prevent the escape of the solution. The solution is lifted by a force-pump into the receiving reservoir. If it is too cupriferous, it is passed over fragments of iron, and the copper precipitated, after which it flows off. The ground regulus contains from 72% to 75% of copper, and from 14 to 16 *loth* (7 to 8 oz. English) of silver in the centner (110½ lbs. English); and the silver precipitate (cement silver) has a *Feine* of about 270 gran. The copper in the vats of the third terrace is cleared from the silver precipitate every twenty-four hours, and that in the fourth terrace every six days.

The process of lixiviation is as follows: 497 lbs. of well roasted ground regulus are introduced (hot, if possible) into the empty lixiviating vat, and spread carefully over the linen filter, and over this regulus a perforated cover is laid so that the fluid thrown upon it may be equally distributed. The tap of the vat is now opened, and water heated to from 70° to 80° Cent. (152° to 176° Fahr.) is thrown over the covered regulus. After from a quarter to half an hour, this hot water is replaced by a desilverised solution of sulphate of copper, heated to a like temperature. As this solution does not contain sufficient free sulphuric acid to lixiviate the charge perfectly, $\frac{1}{2}$ lb. of sulphuric acid is added, which changes the basic sulphate of silver, that is soluble with difficulty, into the neutral sulphate. When, as is usual, eighteen charges are lixiviated during the twelve hours, the 9 lbs. of sulphuric acid required for this number of charges, being first diluted with two quarts of water, is placed in a vessel over the lixiviating vat, and allowed to pass through a tap, drop by drop, into the vat. This last solution, after being heated to the necessary temperature, is conveyed through the lixiviating vats so long as it shows silver on passing, after which it is allowed to escape. The uppermost layer of the charge, 1" thick, being the least desilverised, is scraped off and roasted again. The lixiviating vat is emptied by a copper shovel, and the residues conveyed to the drying house. If sufficiently roasted they should contain at most 1 *loth* ($\frac{1}{2}$ oz.) of Ag. per centner of Cu; if they contain more they must be roasted over again. After the solution has passed through the lixiviating vat, and has desilverised the AgO, SO^s , it passes into the settling vessels. Here the particles of copper carried with it are deposited, upon which the solution passes through the opening into the front compartment, from which it flows into the precipitating vat over bars of copper. During the process, the solution from all the lixiviating

vats becomes mixed, so that in each precipitating vat an almost equal quantity of Ag is precipitated. The ground regulus is principally CuO and $\text{AgO}\cdot\text{SO}^3$ and Fe^2O^3 . The $\text{AgO}\cdot\text{SO}^3$ is dissolved, and CuO and Fe^2O^3 remain behind. The small quantity of $\text{CuO}\cdot\text{SO}^3$ present also dissolves. In the precipitating vats, a quantity of Cu becomes dissolved, corresponding to the quantity of Ag precipitated.

III. THE DRYING AND REFINING OF THE SILVER. — The apparatus for this purpose comprise collecting, stamping or grinding vats and washing vessels; drying kilns, and a gas-generating reverberatory furnace. The collecting vat is similar to the lixiviating vats; the grinding vat is a wooden mortar with a wooden pestle. The washing vessels are of the same size and form as the precipitating vats, only they have no tap between the two bottoms, but instead a wooden pipe, having a tap at the top, goes up the washing vessel from between the two bottoms, so that the vessel is always full. The drying pans are of strong sheet-copper, 19" long, $12\frac{1}{2}$ " wide, and 6" deep, and stand in an iron stove. The silver precipitate, which is impure from the mixture of gypsum and copper, with a *Feingehalt* of 190 to 200 grm., is washed and purified in earthen pans and wooden tubs until it has a *Feine* of 268 to 270 grm. It is then refined in a reverberatory furnace, the bed of which is of wood ashes; on which from 1,500 to 2,500 marks (from about 12,000 to 20,000 ounces) can be refined at one time. The silver, cast into ingots, has a *Feine* of from 281 to 282 grm.

Abstracts and Reviews.

MR. DICKINSON ON GEOLOGICAL "THEORIES."

On Modern and Scriptural Geology, by Joseph Dickinson, F.G.S., ex-President of the Manchester Geological Society; Honorary Member of the North of England Institute of Mining Engineers, &c.; Associate of the Royal Institution of Cornwall; and one of Her Majesty's Inspectors of Mines. Manchester: Thomson and Baxter.

We referred last month to a paper read before the Manchester Geological Society by Mr. Joseph Dickinson, ex-President of that Society, F.G.S., and Government Inspector of Mines for the Manchester District; and on the faith of an abstract published in the *Mining Journal*, we freely expressed our surprise and regret at such a paper being read before a geological society by an ex-president, and Government Inspector of Mines. We have since received the paper printed *in extenso*, and we are sorry to say that it more than justifies the unfavourable opinion we formed on reading the abstract; for not only is it worthless in substance, but it is self-sufficient in style, and utterly illogical and inconsequential in reasoning. It is unpleasant to have to write thus strongly of any production, and it is particularly disagreeable to us to have to do so in the case of Mr. Dickinson, of whose knowledge and judgment in practical matters we have received the highest testimonies. But critics owe a duty to the

public above the consideration of private feelings; and Mr. Dickinson's practical reputation and official position—as a Government Inspector, and an ex-president of our most important provincial geological society—only render it the more necessary to repudiate his notions. Besides in printing his paper for circulation, after what has been already said, he has challenged that kind of criticism from which a hastily written or fugitive production is fairly exempt.

If we did not know that Mr. Dickinson must, for many years at least, have been more or less acquainted with geological "theories," we should certainly have supposed, from reading his little *brochure* of seven pages and a-half, that the author had spent an idle morning in reading some old geological book, and dashed off the first impression of his objections in the evening. Not merely is there no evidence of geological reading, but, on the contrary, it is obvious that Mr. Dickinson—all F.G.S. and ex-President though he be—is most imperfectly acquainted with even the elements of the vast and complicated science he thus seeks so summarily to demolish. From his own statement, this matter has been incubating in his mind "for many years," and he has been "repeatedly returning to the subject." Such being the case, it is simply amazing that a man of common sense could deliberately publish such a crude and slip-slop production as this "On Modern and Scriptural Geology."

Mr. Dickinson describes his notions as "the clear views I now take," but we confess their clearness is not obvious to us. Indeed it is by no means easy to make out what they are, for his phraseology is as vague as that of the old cosmogonists, so that even into the few pages of this pamphlet he manages to cram more than one inconsistency. However, stated broadly, they seem to be that the earth was formed as we now find it, in the six days of Genesis—days of twenty-four hours each. If Mr. Dickinson had stated this belief simply, we should have been content to refer him to the numerous eminent divines of various schools of orthodox theology—from Dr. Wiseman to Dr. Cumming—who have long abandoned the literal interpretation of our translation, and endeavoured to harmonise, by various hypotheses satisfactory to themselves, the admitted facts of geology with the teachings of scripture. But unfortunately for himself Mr. Dickinson is not content to stop here, but supplements the Mosaic narrative by an explanation of his own. The waters being first created, the creation of light followed, and—

"The previously created *watery matter*, which had probably been *assimilating from the beginning*, seems . . . to have become acted on by the forces . . . of "chemical affinity, electricity, magnetism, heat and motion. Like going to like. "Parts aggregating and parts repelling; until what is called a firmament was made. By it the watery mass was divided. The part of the waters which "went above it was called heaven, and the part which went below was called the "earth. . . . The earth then seems to have first become separated from the rest "of the waters, and moved off towards the orbit which it now occupies. . . . "Heat . . . seems to have followed, *resulting in the present arrangement of the "earth, and the subsequent creation of species.* The fossils . . . were *thus created* and made, and the vegetable fossils grew, where the waters were congenial "for their production, and they lie in or near their original place. The present "surface rocks appear to be *as they were left by the dividing firmament.* The "highest mountains and the deepest valleys and seas seemingly indicate *where "the divided matter was toughest and the mass greatest.*"

In this astonishing extract, one of the most curious features is the strange inaccuracy of the writer in dealing with the 1st chapter of Genesis, which is certainly not a little remarkable in so staunch a champion of a "literal" interpretation; for instance, how the present surface rocks should be in the same state *as they were left by the dividing firmament*, since the dry land had not then appeared, decidedly requires explanation. What

process the "watery matter" was going through while it was being "assimilated from the beginning," we do not pretend to divine; neither have we ever heard of water ("the divided matter" in the last sentence) possessing the property of "toughness." But probably it is still more extraordinary to find that, for an original creative power in arranging the world after the first day, Mr. Dickinson substitutes well-known secondary causes—chemical affinity, electricity, heat, &c., to which, following the author of the "Vestiges," he even attributes the *creation of species*. His words in this respect are clear—"Heat . . . resulting in . . . the subsequent creation of species. The fossils were *thus* created and made . . . where the waters were most congenial." We very much fear that Mr. Dickinson would soon find himself in as deep disgrace with theologians as with geologists, were his position sufficiently prominent to make his sayings of importance.

But although this seems Mr. Dickinson's view throughout the greater part of his seven and a-half pages, there is more than one portion quite inconsistent with it. Thus he speaks of the crystalline, metamorphic, and trappean rocks as "forming the grand base or matrix in which the more perfectly stratified rocks have been generated;" an idea evidently plagiarised from Mr. Evan Hopkins, who holds clay-slate to be the exfoliated crust of granite masses, but one clearly inconsistent with the previously stated doctrine that "the present surface rocks appear as they were left by the dividing firmament."

But we have said more than enough about this unhappy pamphlet. When any man, in a few vague and self-sufficient pages, talks of "dispelling the current crude geological theories" of our Murchison's, Lyells, Sedgewicks, and Hopkinses, of course he passes beyond the pale of criticism or discussion. In this case nothing but the official position of the author—which he obviously wishes to bring into prominence in connection with his "clear views"—would have induced us to notice his paper at all.

MINING AND METALLURGICAL PERIODICALS.

(From Prof. J. D. Whitney's Notice in the *Mining and Scientific Press* of San Francisco.)

The interests of the miner and metallurgist are thoroughly cared for by all European Governments, and everything connected with these departments of practical science, in most of the States of the Continent, is carefully watched over by men of long experience and extensive acquirements: therefore nearly all these States publish official or government mining journals, or periodicals devoted to this branch and subjects allied with it.

The *Annales des Mines* is the most important mining periodical in the world. It is the organ of the Imperial Corps of Mines and of Roads and Bridges, and is published at Paris, in six octavo numbers per year, making two stout volumes, filled with original contributions on all subjects connected with mining and metallurgy; together with a good deal of matter relating to steam-engines, locomotives and railroads. These papers are almost always from the pens of regularly educated mining engineers; they are not intended to be popular, but are rather for the use of those who have received a thorough mathematical and scientific training. The *Annales des Mines* has been in regular course of publication for more than fifty years, and the series is by far the most important book a mining engineer can have in his library.

There is also a more popular mining periodical published in Paris, called the *Journal des Mines*, which was established by private parties, and which

contains reports of sales of mining stocks and other particulars of a more purely commercial and less scientific character.

The *Revue Universelle des Mines*, published every two months at Liège, and edited by De Cuyper, an eminent mining engineer, is the organ of the mining interests of that busy little kingdom, Belgium; it has many valuable articles on mining and metallurgy.

Several of the German States support one or more periodicals devoted to mining. The *Zeitschrift für das Berg-, Hütten- und Salinenwesen* is the Prussian official mining journal; it is published quarterly, in quarto form, at Berlin, and has been established for about ten years. It is particularly devoted to the interests of Prussian mining and smelting, and has the fullest and completest statistics of these branches as developed in that country, with elaborate papers on the improvements in mining machinery and smelting processes which have been introduced into the mines and furnaces, and critical notices of all works published in other countries on these subjects.

For the last two years it has been accompanied by a supplement, giving full description and working drawings of the most important new Prussian mining and smelting establishments. Both of these publications are official, and of course thoroughly reliable and complete in everything connected with mining in the Prussian Kingdom.

The organ of the Saxon Government mining interests is a yearly octavo publication called the *Jahrbuch für den Berg- und Hüttenmann*, in which the most minute statistics are of all the government mines and furnaces. But the principal Saxon mining publication is the well known *Berg- und Hüttenmännische Zeitung*, published weekly in quarto form at Freiberg and Leipzig. It is edited by Bornemann and Kerl, the last named of whom is a professor in the Mining School of Clausthal, and who is well known by his excellent work on metallurgy. This periodical contains many valuable articles on the mines of all parts of the world, most of which are written by former pupils of the Freiberg Mining School; it has been in course of publication for the last twenty-one years.

The *Berggeist* is a small but valuable mining paper, published twice a week, in small quarto form, at Cologne. It is especially devoted to the mining interests of Rhenish Prussia.

There is also a weekly mining paper published at Vienna, called the *Oesterreichische Zeitschrift für Berg- und Hüttenwesen*; this is particularly devoted to the development of the very important mining interests of the Austrian Empire.

A yearly publication at Vienna, with text in quarto and folio plates, edited by a high mining official, and called *Erfahrungen im berg- und hüttenmännischen Maschinen-, Bau- und Aufbereitungswesen*, giving the results of all trials of new mining, smelting, and ore dressing machinery made under the superintendence of the Austrian Government, with full working drawings of the same. It is an admirable publication, since Austria is an important mining State, and one in which many new processes have been thoroughly examined and valuable results obtained.

There is also a quarterly journal published at Bonn and devoted exclusively to mining law; it is called the *Zeitschrift für Bergrecht*.

The number of journals and periodicals devoted to mining which are published in the English language is but small.

The *Mining Journal*, a large folio, published at London, contains some valuable matter, especially of a commercial character; but has little scientific value. It is especially intended for those who buy and sell English mining stocks, and as a register of the immense transactions which are carried on in that greatest of all mining countries.

The want which has been so long felt in Great Britain of a more thorough mining periodical has been lately to a considerable extent

supplied by the *Mining and Smelting Magazine*, published monthly at London, in octavo form. This magazine was commenced in 1862, and has thus far been well sustained.

The British Government publishes yearly the complete statistics of the mines and furnaces, as collected and arranged by Mr. Hunt, Keeper of Mining Records. Singular as it may seem, it is only within a few years that this has been done: before Mr. Hunt took up this department, our knowledge of the yield of the mines in England was exceedingly imperfect.

Several periodicals devoted to mining and metallurgy have been started in the United States; but there is not one now published, except the *Mining and Scientific Press* of San Francisco. The *Mining Magazine*, published at New York, first at a monthly and afterwards as quarterly, died a lingering death some two years ago. San Francisco is certainly, if anywhere on this Continent, the place where a mining periodical should be well supported; for nowhere are the mining interests greater, in proportion to the wealth of the community than here. And furthermore, there should be here a library, where complete sets of all the mining periodicals published throughout the world should be accessible to the public; for miners and smelters are too much in the dark as to what is doing in these departments in other countries.

SCIENCE AND ART DEPARTMENT.—SCIENCE EXAMINATION, 1863.

At the General Examination of the Science Schools and Classes held throughout the kingdom in May last, Queen's medals were awarded, in the following subjects, to the undermentioned candidates:—

GROUP I (GEOMETRY AND DRAWING).—Gold medal awarded to William T. Rowden, science teacher, Bristol, aged 23.

MECHANICAL AND MACHINE DRAWING.—Candidates examined, 194; passed, 56; honourable mentions, 49; 3rd class prizes, 21; 2nd class prizes, 15; 1st class prizes, 5; failed, 48. *Medallists*: Thomas Butterworth, mechanic, Oldham, aged 33, *silver*; John A. Griffiths, Manchester, aged 15, *bronze*; Charles J. Topple, pattern maker, Woolwich, aged 18, *bronze*.

APPLIED MECHANICS.—Candidates examined, 22; passed, 7; honourable mentions, 4; 3rd class prizes, 2; 2nd class prizes, 3; 1st class prize, 1; failed, 5. *Medallist*: Charles Berrell, medical student, London, aged 19; *silver*.

MAGNETISM AND ELECTRICITY.—Candidates examined, 207; passed, 54; honourable mentions, 43; 3rd class prizes, 13; 2nd class prizes, 21; 1st class prizes, 8; failed, 68. *Medallists*: Cornelius O'Sullivan, geologist, Bandon, aged 21, *silver*; Theodore Butterworth, pupil teacher, Middleton, aged 17, *bronze*; John G. Anderton, optician, Birmingham, aged 19, *bronze*.

GROUP IV (CHEMISTRY).—Gold medal awarded to Richard Googan, geologist, Bandon, aged 21. Cornelius O'Sullivan was reported very nearly equal to Mr. Googan, but having received the silver medal last year, could not receive it again, he was therefore awarded an exceptional prize of books.

INORGANIC CHEMISTRY.—Candidates examined, 679; passed, 199; honourable mentions, 77; 3rd class prizes, 139; 2nd class prizes, 114; 1st class prizes, 67; failed, 83. *Medallists*: John Connolly, currier, Bandon, aged 21, *silver*; George F. Snelus, schoolmaster, Macclesfield, aged 25, *bronze*; Joshua Doherty, teacher, Belfast, aged 26, *bronze*; William Arkell, Manchester, aged 15, *bronze*.

GEOLOGY.—Candidates examined, 129; passed, 26; honourable mentions, 30; 3rd class prizes, 31; 2nd class prizes, 17; 1st class prizes, 11; failed, 14. *Medallists*: Robert Smith, watchmaker, Belfast, aged 45 *silver*; George Donaldson, designer, Belfast, aged 23, *bronze*; John J. Mines, attorney's clerk, Huddersfield, aged 16, *bronze*.

MINERALOGY.—Candidates examined, 46; passed, 10; honourable mentions, 15; 3rd class prizes, 11; 2nd class prizes, 3; 1st class prizes, 2; failed, 5. *Medallists*: William T. Rowden, science teacher, Bristol, aged 23, *silver*; Henry K. Jordan, agent at steel works, Bristol, aged 24, *bronze*.

MINING.—Candidates examined, 29; passed, 8; honourable mentions 8; 3rd class prizes, 4; 2nd class prize, 1; 1st class prizes, 2; failed, 6. *Medallists*: William T. Rowden, science teacher, Bristol, aged 23, *silver*; James Radcliffe, coal miner, Glasgow, aged 23, *silver*.

METALLURGY.—Candidates examined, 63; passed, 16; honourable mentions, 15; 3rd class prizes, 13; 2nd class prizes, 5; 1st class prize, 1; failed, 13. *Medallist*: James R. Dempster, architectural draughtsman, Glasgow, aged 25, *silver*.

SOUTH WALES INSTITUTE OF ENGINEERS.

A general meeting of the members of this Institute was held at Merthyr Tydvil, on February 3rd, Mr. A. Basset, President, in the chair. A discussion took place on Mr. John Williams' paper on the long wall system of working coal as practised at the Lletty Shenkin Colliery, in which he stated that where the system had been introduced the coal was obtained in far larger blocks, in more marketable condition, and in larger quantities than by the old system of pillar and stall. The chief difficulty to contend with was the obstinacy of some of the men to the introduction of this system.

Mr. Wilkinson, of the Middle Duffryn, said that he perfectly concurred in what had been stated by Mr. Williams, and the best way to promote discussion was for some one who wanted information to ask some questions.

The President suggested that Mr. Harrison should give the Institution the benefit of his experience at New Tredegar Pit.

Mr. Harrison said that Mr. Williams had stated that in each gate road from 12" to 18" of the top had to be taken down to maintain head room for the horses to travel. He should like to know what height, therefore, Mr. Williams took for his headings. He (Mr. Harrison) was working long-wall, and found that the "pucking" of the coal continued, whereas Mr. Williams said in his paper that such was not the case.

Mr. Williams said he believed there were a few "puckings" in some collieries, but even here they were very much reduced by the long-wall system. The proper height to take the headings was 6' 6". The top settled down on the gob walls, which gave way until at length it required to rip again the layer and top from 12" to 18". The stones came in very serviceable to keep the roof up. All the coal was taken away by the long wall system—they left no pillars at all—if they left pillars they would form the "prickers." The second heading was also taken down from 12" to 18" after the second ripping. In reply to questions, Mr. Williams stated that they had worked 12½ acres, and the average produce had been 6770 tons of coal per acre.

Mr. Brown, Mountain Ash, agreed almost entirely with Mr. Williams' paper, the only thing being that different calculations were arrived at by different people. He quiet agreed that long-wall system was the legitimate system to be adopted with the seam which he was then working. Speaking

from his own experience, he did not quite agree with Mr. Williams as to the amount of coal he got per acre, being only about 1,200 tons per acre loss, or less than 20 %. Now, if it went forth to the world that Mr. Williams succeeded in obtaining nearly 7,000 tons of coal per acre, and he (Mr. Brown) could only get about 5,000 tons, his employer would be sure to come and say to him—what is the reason you cannot get as much coal as another man?—and such would be put down to his (Mr. Brown's) discredit. He should, therefore, be glad if Mr. Williams would give them a little information as to how he got so much as 6,770 tons out of an acre of coal 4' thick. It was generally supposed that there were about 1,500 tons of coal in an acre 1' thick; so that if Mr. Williams' 4' seam of coal was on an average 5' 4' thick, if he got out all the coal, he would have about 7,500 tons an acre—he meant to say that if the whole of the coal could be swept away in one block out of that seam it would only be 7,500 tons, and he could not, therefore, see how Mr. Williams was able to work that seam with such results as he had stated. As regarded the long-wall system, he (Mr. Brown) said that up to 6' the long-wall could be most successfully worked, although it may not at all times appear to be to the advantage of the owner so to do in the first onset. There were a great many "puckings" to be contended with, and perhaps the greatest difficulty was when the men got into what was called a "fox-hole" (a narrow part of the pit) before they again got into the open space. The great difficulty was the narrow work of the long-wall after having once opened it up.

Mr. Williams said he was not now prepared to go into the calculations which enabled him to come to the results which he had arrived at, but he had no hesitation in stating that everything which he had given in his paper was strictly correct. He had carefully measured the coal, and from his measurement he had made his calculations, and he believed that they had actually got a larger quantity than he had stated in his paper, because there was nothing left whatever. With respect to getting a continuous face in one slip there were many difficulties, but still it could be done if care was taken.

Mr. Brown said he should be very glad if any person would tell how they could keep one continuous face, with a set of men ten, twelve, or fourteen yards apart. How could they get one continuous face regularly kept up when perhaps one set of men would only work three days a week, while another set of men would work six days? Men would not shift out of their working places—one man would go a-head and leave another man in the lurch—and if he was told to go into another part of the pit, he would not; and if he was told that his place should be stopped, he said, "Very well, I'll go home," and thus the proprietor lost the services of a man, which was a most important thing now. All he (Mr. Brown) could say was, that if Mr. Williams could manage his men and move them about from one place to another, it was a great deal more than he (Mr. Brown) could, and he should, therefore, be glad to know how it was done. All he could say was that he could not keep a continuous face, try what he would. There would not, however, be much injury if they did not allow the men to get too far a-head of each other.

Mr. Harrison said that when they kept a straight face there were more chances to get the stalls in longer distances together, so as to get each stall a couple of yards one before another. The gobs did not come down but about every 8 yards. He was now advocating the zig-zag form rather than the continuous.

Mr. Williams said that the keeping a continuous face in the same slip was a source of great trouble, but he had succeeded by putting a set of men in it every 14 yards, and by this means he had succeeded in getting a face 140 yards long.

Mr. Brown again said that he could not keep a continuous face, for he

found in some instances that there were large slips of stone which the men had to cut through, which another set of men would not have to contend against. He would not be supposed to be advocating either the continuous face or what was termed the "hitch and step" system—each colliery manager would have to judge for himself as to the best plan to be worked.

ON THE DISCOVERY OF COAL IN BRAZIL.

Communicated to the Manchester Geological Society by

MR. JOHN PLANT.

As this Society is a good deal interested in coal, I shall perhaps be permitted to bring before the notice of the meeting a discovery of a coal-field in one of the provinces of Brazil; the facts have been communicated to me by my brother, Mr. Nathaniel Plant, who has been for the last twelve years, more or less, engaged in exploring the almost unknown inland parts of the province of Rio Grande do Sul, in Brazil. The coal-field to which I have to refer possesses extraordinary features, so much so, that the Brazilians have said it is "*without parallel in the world.*" It has been generally remarked, in most of the works describing the natural productions of South America, that there is a singular absence of coal deposits in that vast continent, especially so with regard to Brazil; and I believe, up to 1859, there was no certain information in print about any deposit of coal existing there; but, as I remarked, my brother has been exploring the country since 1852, and has therefore had occasion to go over extensive districts in the southern provinces of Rio Grande do Sul, examining the mountainous parts for metalliferous deposits; and in 1861, he heard a rumour from some of the residents at San Pedro, that coal had once been found in the extreme south of the province. He made preparations to explore this district, and it then turned out that a Mr. W. Boulicch had observed coal there on the surface, the report of which appears to have reached England, for it was quoted by a writer in the *Quarterly Review*, 1860, and referred to by Mr. Hull, in his work, "The Coal-fields of Great Britain," 1861. It was there mentioned as being a "vast coal-field sixty square leagues in extent, lying about forty miles from the coast of the Atlantic, and in the province of Rio Grande do Sul." It appears to have been lost sight of until about the end of 1861, when my brother determined to proceed in search of it, and make a thorough examination into its features, and report thereon to the Government. His first report, addressed to the governor of the province of Rio Grande, The Illm: Sr: T. Boulicch, is dated April, 1862. The second report is addressed to the Imperial Councillor of State at Rio Janeiro, dated May, 1863; and the third report to the Provincial Governor, dated November, 1863. These reports contain a considerable amount of interesting matter relating to his discoveries of metalliferous deposits of iron, the geological features of Rio Grande, and very full particulars of the coal-field I have now to describe. The locality of this coal-field is at the extreme southern part of the province of Rio Grande do Sul, just on the border lands between Brazil and the Banda Oriental, or Republic of Uruguay, as indicated on the map before the meeting; its distance from the coast in a direct line may be about sixty miles, but it would hardly be possible to find a practicable route, to bring the coal down this way, as an extensive but shallow coast lake, named Lake Merim, lies between; and the sea-board is made up of a vast extent of dangerous sands and low banks scarcely perceptible a mile from the shore. The river Jaguarao, and its tributaries, the Candiota, Tigre, and Jaguarao-chico, drain the surface of the coal-field. The chief stream flows east into the Lake Merim, and that lake finds an outlet on the north by the river San

Gonzalo, into a second great coast lake, Lagos dos Patos, which empties itself through the harbour of Rio Grande do San Pedro, this being the only safe opening to the Atlantic Ocean for many degrees along this coast, north or south. The eastern borders of these lakes and rivers are only separated from the ocean by a narrow spit of sand-banks. The nearest point to which the coal approaches a port of embarkation is about twenty miles above the mouth of the Jaguarao, and sailing vessels, up to 100 tons burden, carry on an active trade in hides, tallow, and cattle produce, between the town of Jaguarao (a place of about 10,000 inhabitants, lying sixteen miles up the river Jaguarao); and the port of Rio Grande, so that water carriage exists from the Atlantic port almost up to the coal-field. The area of the coal-field is conjectured to be about one hundred and fifty square miles, and the coal-basin appears to rest upon mica schist of a much older formation: it is bounded apparently on all sides by syenitic, trappean, and other igneous rocks; in fact, the country lying to the north of the coal-basin, as far as the borders of Lagos dos Patos, is described as being almost a perfectly level tract of basalt in its whole distance of forty miles; and the idea is regarded with much favour, that a tramway over this route would be more direct and practicable than for the coal to be brought down to the coast by the circuitous bendings of the lakes and rivers; an engineer is at present surveying the district, for the purpose of estimating the cost of a single line tramway, an item of expense which must be comparatively small in going over a country which is described as being as level as a billiard table.

The principal features of this coal-field, as far as it has been examined, consist in the great depth of some of the coal-beds, and the facilities which it presents in a long escarpment for getting the coal by open quarrying; it would require neither deep shafts, pumping, nor drawing-engines, and scarcely a tithe of the expensive "plant" required to work the coal from most other fields;—here the outcrop presents no less than 65' of bright bituminous coal exposed along the margin of a river valley, and all the implements required to get the coal will be the miners' pick and blasting power,—the coal would almost fall unaided into the waggons below.

The section accompanying the map shows the series of coal-beds from the surface, of 65' of coal in 114 of strata: it is an outcrop, and runs along the margin of the valley for about three leagues, and can be examined in its entire extent. In some places the interstratified beds have disappeared, and it there forms a solid seam of coal of about 65' in thickness; the dip of the beds is about 5°, and generally to the east, or towards the coast. The thickest coal, that to my knowledge has yet been found, is at Pictou, in British America, where there is a small coal-field that has two beds, one of 37', and the other 22'; but they are separated by 157' of strata. In Bear Mountain, in the States of America, there is coal 40' thick, but this is believed to be from the joining of several beds of anthracite coal. In Virginia, near Richmond, there is coal said to be 30' to 40' thick. Two of these coal-basins afford proofs of being coals of Oolitic age, and not of the true carboniferous. My brother states that in Brazil he has found the *Glossopteris*, a fern by which the Oolitic coals are said to be distinguished in Australia, Bohemia, and North America. This shows that the age of these coals may be cotemporary in different parts of the world. The thickest bed in this Brazilian coal-field is the lowest of the section, and appears to be 25' clear; and then below follows a series of older strata, which have all been traced along the line of the valley, but their full depths have not yet been stated; there is nothing apparently in the underlying deposits which will lead us to doubt the suggestion that these may be Oolitic coals; but I think that is a question which may be left for the present, at least, until the specimens of fossils and coals which have been

promised to be sent have been examined and compared with those already decided upon by geologists to belong to the Oolitic period.

The following is the section spoken of :—

*Section of the Strata shown along the valley of the Candiota,
Rio Grade do Sul.*

	Surface.	ft.
	Light Red Iron-bearing Sandstone	28
COAL.	A Good but Shaly Coal	9
	Sandy Shale	5
COAL.	Hard Coal	3
	Shale and Blue Clay, with Fossil Ferns	5
COAL.	Shining Splintery Coal	11
	Parting of Blue Clay	2
COAL.	Good Deep Coal	17
	Fossiliferous Shale	9
COAL.	The Deep Coal	25
65 feet of Coal in a depth of 114		
	Fossiliferous Shales	Thickness not given.
	Sandstone	
	Limestone	
	Mica Schist	
	Metalliferous Limestone	
	Syenite	

This section may be regarded as correct, as far as it gives the true thickness of the exposed escarpment ; that is, down to the base of the bed of coal, 25' thick ; and these five photographs which I have the pleasure of exhibiting, will convey a clearer notion of the aspect of the face of the

high cliffs of coal along the margin of the valley of the river Candiota than any description could pretend to; they were photographed in November last.

The second coal-field lies away some hundred leagues to the north, in the valley of a river, Dos Ratos, near Porto Alegre, the capital of the province; this basin is small, and much disturbed by igneous rocks; a license to work this coal-mine was granted a few years back, but nothing appears to have been done up to 1863; and, although well situated for easy carriage by river and lake, through the really industrious part of the province, the want of enterprise and capital have prevented it being turned to good account by the people of Rio Grande do Sul.

A third coal-field has been discovered in the small province of San Catharina, lying N. E. of Rio Grande do Sul: it is reported to be a deposit of about eighty square miles, and lying far from the coast, in a range of hill; it appears not to be so readily got at, or the coal to be as good and abundant as it is in the greater deposit at Candiota.

The three coal-fields are ranged as though belonging to one line of deposit, afterwards separated by igneous bosses and tracts of porphyry and basalt, but the fields are not much distorted by faults. They are the first instances of coal having been found and examined in the great empire of Brazil, with its three millions of square miles of country. It is a most valuable thing to the Brazilian Government, who annually import for gas and steam purposes 250,000 tons of coal, at 49s. per ton. The Brazilians, if they are wise enough to open these fields of coal, will be enabled to supply themselves with coal at 18s. per ton, and also to form a profitable depôt for the supply of the great ocean steamers to India, China, and Australia. The supply of coal must be very abundant, covering, as it does, an area of one hundred and fifty square miles.

It would, therefore, be an important thing for the Brazilian Government, who pay so heavily for coal, if, by aid of a company, they could procure coal in their own empire, and at a price which would pay a good dividend to all parties. Brazilian enterprise is apparently not well calculated to carry out successfully any mining operations, either for coals or metals. It requires both English capital and skill to carry out these works; and, although my brother has the imperial concession of the Candiota coal-field, he feels it will be almost impossible, unless he finds English capital and energy, to make it a blessing either to Brazil or to the commerce of the world at large.

In conclusion, allow me to say that in a short time I shall have the pleasure of submitting to the members of this Society the specimens of coal and fossils now on their way to England, and I may perhaps be able to read a paper upon the geological feature which have now only been communicated as a rough sketch.

THE MONT CENIS TUNNEL.

An unusually large attendance was attracted to the Institution of Civil Engineers at the evening meeting of February 16th, to hear Mr. Thomas Sopwith, jun.'s, paper on "The Actual State of the Works on the Mont Cenis Tunnel, and Description of the Machinery Employed." The paper was listened to with the greatest attention, and excited the liveliest interest—particularly that portion where the author so clearly elucidated the comparative cost and rate of working of M. Sommeiller's apparatus, and the old method of tunnelling.

We may mention that Mr. Thomas Sopwith, jun., is the eldest son of Mr. Thomas Sopwith, F.R.S., M.I.C.E., the eminent mining engineer, so well known in connection with Buddle, Stephenson, and other great

northern engineers, and now for many years the chief manager of the famous W. B. lead mines and smelting works.

This tunnel would form the completing link of the Victor Emmanuel Railway, and be the means of putting France and Italy in direct railway communication. The railway on the French side was already opened to St. Michel, in Savoy, and on the Italian side to Susa, in Piedmont. When the whole line was completed, the mails and traffic with India might perhaps be advantageously transferred from Marseilles to some Italian port, as the Mediterranean sea transit would thus be materially shortened.

During the last twenty years many routes had been surveyed and recommended for crossing the great barrier of the Alps. Of these, that by the Mont Cenis was generally considered the most feasible; and it was only a question, whether the mountain should be crossed by a series of inclines, or whether a tunnel should be made. In 1857, Messrs. Sommeiller, Grandis, and Grattoni, brought before public notice a new system of boring by machinery, instead of by hand labour. A Government commission was appointed to examine and report upon it, and to see if it could be applied to the boring of the tunnel under Mont Cenis. Their report was favourable, and M. Sommeiller and his partners were shortly afterwards charged with the execution of the work.

The ends only were available for attack, it being impossible, as was known from the first, to sink shafts. It was feared that the ventilation would seriously retard, or altogether prevent, the completion of the tunnel; but this fear was uncalled for, as the artificial ventilation in collieries overcame greater natural difficulties, and the ventilating current passed through a longer distance, than could possibly be required in this tunnel. M. Sommeiller also proposed to use compressed air for driving the machinery, and calculated that on its escape, a volume of fresh air would be supplied, adequate to the requirements of the workmen. The tunnel at the Modane, or French side, was of the following dimensions:—25' 3½" wide at the base, 26' 2¼" wide at the broadest part, and 24' 7" in height; the arch being a semicircle nearly. At Bardonnèche, the height was increased 11½". The exact length between the ends was 7·5932 miles. The present ends would not be the permanent entrances, as it was intended that a curved gallery should leave the tunnel at the north side, 415 yards from the end, and at the south side, 277 yards.

At Modane, the tunnel was built entirely with stone; at Bardonnèche, for the greater part, the side walls only were of stone, and the remainder of brick. The Bardonnèche end was 434' higher than that at Modane. For one-half the length of the tunnel, therefore, from Modane to the middle, the gradient would be 1 in 45½; the other side being driven with only sufficient fall, 1 in 2,000, to allow of the water escaping.

When the tunnel was complete, it was expected that there would be a constant current of air from the north to the south; the latter was not only the higher end, but the air was more rarified and exposed to the heat of the sun, whilst the entrance at Modane was under the shade of the mountain.

The establishment consisted at each end of machinery for compressing the air, workshops for making and repairing machinery, offices, storehouses, residences for the engineers, and barracks for the workmen. At Modane, the entrance of the tunnel was 328' above the bottom of the valley, where the workshops were placed, with which there was a communication by means of an inclined plane, worked by a water balance.

Different systems of tunnelling by machinery had been tried in England; amongst others one by Captain Penrice, R.E., in which it was intended to drive a gallery about 4½' diameter, and by means of repeated blows from a heavy frame loaded with knives, to reduce the whole of the excavated materials to small chippings and dust. It seemed, however, to the author,

that any system of tunnelling must be deficient, which did not make so cheap and readily applicable a power as gunpowder available; and that by the trituration of the rock to such small particles, as in Captain Peurice's system, a great amount of work was unnecessarily performed.

In M. Sommeiller's system, whilst machinery was employed for accelerating the progress usually made by hand labour, gunpowder was also available. He had succeeded in producing a compact machine, not weighing more than 6 cwt., which could pierce a common bore-hole, about $1\frac{1}{4}$ " diameter, and 3' deep, into a rock in twenty minutes, where two miners would have required two hours. Further, he had arranged a moveable support capable of carrying eleven such machines, any one of which could be worked at almost any angle, and of allowing the free action of each, in a gallery 10' square. This support could be removed when it was necessary to explode the holes bored by the machines. The machine was of very ingenious construction. It consisted of two parts;—one, a cylinder for propelling the borer against the rock; the second, a rotary engine for working the valve of the striking cylinder, turning the borer on its axis at each successive stroke, and advancing, or retiring, the striking cylinder, as occasion required. It gave 250 blows per minute. The effective pressure on the piston in striking was 216 lbs.; the length of the stroke was from 2" to $7\frac{1}{4}$ ". Although simplified as much as possible, the nature of the work the machines performed was so severe, that they were liable to frequent derangement, and a large stock was kept on hand. The cost of each machine was about 80*l*. The compressed air was used at a pressure of five atmospheres above atmospheric pressure, and was conveyed to the 'fore-head' of the advanced gallery by a pipe $7\frac{3}{8}$ " in diameter. The advanced gallery was the only place where the machines were used; the enlarging of the tunnel to the full size, walling, &c., were performed by manual labour.

The system of working was to bore eighty holes in the fore-head of the advanced gallery. The frame and machines were then withdrawn, and a set of men charged and fired the holes; afterwards replaced by another set to remove the *déblais*. The division of time amongst the different classes of labour was very variable. It might, however, be averaged as—

From 6	to 8 hours	for the machinists,
„ 1 $\frac{1}{2}$	„ 2	„ for charging and firing, and
„ 3	„ 5	„ for removing the <i>déblais</i> .

Thus there were almost two complete shifts every twenty-four hours. An alignment was made about once in three months, from an observatory at each end. As yet no error had been detected.

Three or four large holes, each about 4" diameter, were bored near the centre of the fore-head. These were not charged and exploded, their purpose being to weaken the surrounding rock. The remainder were charged, those adjoining the centre being first fired, and the result of these explosions was a cavity. The remaining holes were then exploded from this cavity outwards.

The workmen were industrious, under circumstances which required more than ordinary perseverance. A premium on their wages was given for more than a certain advancement per day. At the time of the author's visit, one metre per day was the standard. For a progress of—

$1\frac{1}{10}$ metre per day	..	$1\frac{1}{10}$ day's wages was paid.
$1\frac{1}{8}$ „ „	..	$1\frac{1}{8}$ „ „
$1\frac{1}{6}$ „ „	..	$1\frac{1}{6}$ „ „
$1\frac{1}{5}$ „ „	..	$1\frac{1}{5}$ „ „

This scale was subject to adjustment every fortnight.

The *déblais* resulting from the explosion of the eighty holes was removed

in small waggons. Its removal was well organised, and considering the circumstances, quickly effected. It would be much accelerated, if it was possible to construct an iron frame, strong enough to be placed close to the fore-head at the time of the explosion, and receive without injury the products of explosion, which could be removed *en masse*, or nearly so.

Two descriptions of machines for compressing air were in use,—one on the hydraulic ram principle, the other resembling a pump. In the first, the water was admitted, with a pressure of $85\frac{1}{2}$, into a column, or vessel, containing air, about 14' high, and 2' in diameter. The water by its momentum rushed up the column, compressed the volume of air, and forced it through a valve into a reservoir. The pressure valve being closed, the exhaust valve was opened, and the water fell in the column, at the same time its place was taken by air, and the machine became ready for another stroke. This machine made $2\frac{1}{2}$ strokes per minute, and was capable of supplying about 20 cubic feet of air, compressed to five atmospheres, per minute. The other machine consisted of a horizontal pump and two vertical branches. The piston was surrounded by water, which rose and fell alternately in the two columns: when it rose, compressing the air, and forcing it through the outlet valve; and when it fell, creating a vacuum, which was filled by air at atmospheric pressure.

The tunnel, on the 30th June, 1863, had been driven (including the advanced gallery) at Modane 1092·25 metres, and at Bardonnèche 1450·00 metres. The advancement in June last, at Modane, was at the rate of 4·719' per day. At this rate of progress at both ends, the tunnel would be finished in nine years two and a-half months from that time. It was not, however, too much to expect a progress of 2 metres per day at each end, seeing that machines had only been in use at Bardonnèche about two years and a-half, and at Modane half-a-year. A great part of that time had been taken up in experiments, and the men were not thoroughly habituated, as yet, to the manipulation of the machines. The machines were also being much improved. With an average rate of 2 metres per day from June 30th, 1863, six years seven months would be required for the completion of the tunnel, as compared with twenty-six years three months by hand labour, 1·655' per day at each end, the average rate of progress previous to the introduction of the machinery. The machinery in use at Mont Cenis was made, for the greater part, at Seraing, near Liège. M. Sommeiller confidently expected an advancement of 3 metres per day at each end. If that were the average from June 30th, 1863, the work would be completed in four years eight and a-half months from that time.

In the advanced gallery at Modane, the number of workmen employed during the twenty-four hours was as follows:—

- 88 machinists, in two sets of 44 each.
- 9 chargers in one set.
- 30 labourers for removing the *déblais*, in one set.

127

344 men were also engaged in enlarging and walling, giving a total employed underground of—

471, and including blacksmiths, stonedressers, and other labourers, at the surface, there were employed at the tunnel	700
Mechanics, brakemen, &c., in the workshops, machinery, &c.	240
Occasional labourers.	200

Or a total at Modane of 1,140

At Bardonnèche the number was greater; 1,200 to 1,400 being generally employed, giving a total of 2,540 on the works.

The result of a rough comparison was to show that, in the present development of the Sommeiller system, an advancement three times quicker than by hand-labour might be effected, but at about two and a-half times the cost; judging rather of places where it might be generally applied, than by the Mont Cenis only. The proportion of two and a-half to one increase of cost referred only to what was known as mining charges in the advanced gallery, *i. e.* wages, tools, candles, and gunpowder. This proportion was notably diminished in the case of a railway tunnel, where enlarging, timbering, walling, laying of rails, &c., were charges common to both systems. In the case of a tunnel through rock, costing, when completed, 30*l.* per yard, the two systems might compare as follows:—an increased advancement in favour of machinery of three to one, at an increased cost of four to three.

The ventilation was good in the advanced gallery, the exhaust air from the machines affording an ample supply. During the time of exploding the holes, a jet of air was left open. Further back, where the men were employed in enlarging the tunnel, the ventilation was insufficient. The tunnel was therefore being divided with a horizontal brattice,—the upper section being in communication with a chimney on the mountain side. The air was intended to pass along the under side of this division, and then return by the upper part, which had an area of seven square metres.

The works were now performed at the charge of the Italian Government. On their completion the French Government was to pay 760,000*l.* for that portion of the tunnel situated in its territory—one-half the entire length—together with a premium of 20,000*l.* for each year, by which a term of twenty-five years, counting from January 1st, 1862, was reduced. This premium would be increased to 24,000*l.* for each year, by which a term of 15 years was reduced, counting from the same time. In addition, the French Government would pay interest at 5% per annum on such portion of the tunnel as was finished. If, however, the Italian Government did not complete the work within twenty-five years from the time of making the agreement, or if they renounced the works before that time, the French Government was absolved from further payment. If the works were finished, as there was every reason to suppose they would be, in ten years from June 30th, 1863, the French Government would pay 1,287,000*l.* for the construction of one-half of the tunnel, or at the rate of 210*l.* per metre.

Extracts, Notes, and Memoranda.

THE RICHEST MINE IN THE WORLD.—Probably the richest and most profitable single mine in the world, at the present time, is the Gould and Curry Silver Mine in California, the first annual report of which has just been published. This company first commenced returns in February last, and the aggregate yield of the mine from that period to the first of December last reached the enormous total of \$3,949,909 (about 800,000*l.*). The amount of dividends declared for the seven months ending with the above date was \$1,464,400 (about 300,000*l.*); besides which a heavy expenditure has been made out of the profits on new works and improved machinery. The amount of amalgam returned during the twenty days ending Dec. 11 was 9,381 lbs., yielding \$225,000 (45,000*l.*) worth of bullion, or an average of 2,650*l.* worth per working day. The greatest quantity returned in any one day was on Dec. 23, when bullion to the value of nearly \$20,000 (about 4,000*l.*) was taken out of 3,555 lbs. of amalgam. The ores—the average value of which is \$400 (80*l.*) per ton—are divided into three classes. Of the first class 24½ tons have been

shipped to England, which are valued at \$2,800 (560*l.*) per ton ; of the second class 4,812 tons have been delivered to the company's mill, and shown an average value of \$316 (nearly 65*l.*) per ton ; of the third class 43,907 tons have been raised, which have yielded \$544 (111*l.*) per ton. The cost of mining the ores including all expenses is \$8 (33*s.*) per ton, and the cost of reducing \$38 (8*l.*) per ton. By the end of March 80 heads of stamps will be at work, capable of reducing 75 tons of second and third class ores per twenty-four hours ; and other improvements will be in operation about the same time, by which it is anticipated that the cost of returning will be much reduced.—The mine is divided into 1,200 feet or 4,800 shares, which have been in demand at upwards of \$5,000 (1,000*l.*) per foot—about 1,250,000*l.* for the mine. The monthly dividends per foot have been about \$125 (25*l.*), but are expected to be at least \$150 (30*l.*), or 360*l.* a year, for 1,000*l.* The assets, exclusive of bullion and cash on hand, are valued at \$1,360,000 (272,000*l.*). There is every prospect that in the current year this mine will return produce of more value than all the copper mines of the West of England put together, and give nearly 450,000*l.* profit to the fortunate shareholders. The English money value we give for the American dollars is within the mark, for it must be remembered that in California the currency is still gold, and not "greenbacks."

MANCHESTER GEOLOGICAL SOCIETY.—The monthly meeting of this society was held at the Museum, Peter-street, on February 23rd (Mr. A. Knowles, the President, in the chair). Mr. Joseph Dickinson presented specimens of rocks which he had taken from the tunnel at Mont Cenis. He explained at some length the geological formation of the mountain, and said that the rocks appeared to be metamorphic, and as yet the workings had not touched any granite. The commonest stone was a sort of chlorite schist ; there were also large masses of quartz and limestone, but the most interesting specimens he possessed were of the coal (anthracite) that was found associated with these metamorphic rocks. Between Modane and St. Michel this coal was being worked to supply the district. It was as irregular in thickness as the rocks, and it dipped in such a variety of directions that it was impossible to say which was the floor of the deposit, and which was the roof. He examined some of the seams, but could not find any traces of *stigmara ficoides*. Neither the limestone nor any of the rocks in the neighbourhood were stratified.—Mr. J. Atkinson (one of the hon. secretaries) read a paper by Mr. John Taylor, "On the Drift Deposits in the neighbourhood of Crewe." The paper described the results of a series of investigations in the Great Cheshire plain, principally in the neighbourhood of Crewe. An acquaintance of underlying strata could only be made by an examination of well-borings, and it was, to a great extent, from this source that Mr. Taylor had obtained his facts. He found that the strata were remarkable for the vast number of shells they contained. In the upper beds, at Northwich, mammalian remains, including an elephant's tooth, has been found, and, at Barthomley, fragments of flints had been discovered, which bore marks of having been chipped.—Mr. J. Plant said he thought the paper showed there was a striking dissimilarity between the character of that drift and the drift around Manchester, though it must have belonged to the same great valley in which was deposited the drift from Liverpool to Shrewsbury.—Mr. Hull and Mr. Atkinson said that they thought there was no great difference between the beds described by Mr. Taylor and those at Manchester.

COULTHARD'S BLAST ENGINES.—The *Colliery Guardian* gives the following results of the working of one of these engines erected by Messrs. Coulthard, at the Stanton Iron Works, near Nottingham. The engine has an air cylinder 56" diameter and a steam cylinder of 21" diameter, both having a clear stroke of 3', and with a pressure of steam in the boiler of

40 lbs. per square inch, and with the engine making only thirty-five revolutions per minute, or at the rate of 210' per minute, a pressure of blast is uniformly maintained at $3\frac{1}{2}$ lbs. per square inch, in sufficient quantity for the furnace of 15' diameter. These results, says the *Guardian*, are far in advance of those obtained by any other blast engines, and will at once convey to the practical mind the fact that there can be no loss of air, but that the whole cylinder full is utilised at every stroke of the engine. The proper speed of the engine is about fifty revolutions per minute; it is, therefore, evident that with increased speed an increased amount of air would be obtained. The action of the india-rubber ball valves is perfect, as they can be constantly seen at work rising and falling with great freedom. One curious fact in connexion with these ball valves may be mentioned, that is, as they rise from their seats, they turn partially round by the action of the air; this action secures them great durability, as the valve never beats twice consecutively in the same place. The trial on the whole seems to have been most satisfactory.

MIXTURE OF SPIEGELEISEN WITH IRON OR STEEL PRODUCED BY THE PNEUMATIC PROCESS.—Mr. R. Mushet, of Coleford, Gloucestershire, has patented a suggestion for mixing melted spiegeleisen or other alloys of iron and other metals—such as iron and titanium, iron, tungsten, and manganese, or iron, manganese, and titanium—with melted iron or steel produced by the pneumatic (Bessemer's) process. He proposes to effect this by melting the spiegeleisen in an air-furnace or cupola, so contrived that, when melted, it can be run off, simultaneously with the melted iron or steel from the Bessemer converting vessel, into the heated ladle arranged to receive the metal from the latter—so that the two streams may commingle together. When the mixture is found to be imperfect, a more intimate one may be brought about by "poling" it, with dry wood, while the streams are pouring into the ladle; an operation which causes a disengagement of gases with violent ebullition of the melted metal, and thus renders the mixture more homogeneous.

MINERS' ASSOCIATION OF CORNWALL AND DEVON.—The fourth general meeting of this Association was held at Redruth on January 29th, Mr. Charles Fox in the chair. In his address Mr. Fox referred to the various kinds of boring machines in use, especially that one at Mont Cenis Tunnel, to the use of iron ropes instead of chains, to the advance in the prices of copper and tin, and to the cost of tin dressing. It appears from their reports that, in consequence of two donations of 50% each, one from Mr. J. S. Enys, and one from the President, Mr. J. F. Basset, the debt of the Association has been reduced by 50%; and their subscriptions amounted last year to 392*l.*, against 320*l.* the previous year.

COATING OF IRON MONUMENTS WITH COPPER.—The most remarkable application of electro-metallurgy yet made has been that recently carried out so extensively in Paris by M. L. Oudry, the director of the electro-metallurgical works of Auteuil, who has succeeded in coating the iron fountains, large rostral columns and candelabra, and several thousand lamp-posts in the great squares and thoroughfares of Paris, with copper, so effectually that it is impossible for the most careful observer to distinguish them from bronze. M. Oudry commenced his experiments in 1854, only operating on wrought-iron and small castings, by a system which consisted of coating the casting with a thin film of copper in a bath of cyanide of copper and potassium, and then (this coating not being sufficient) heating in a bath of sulphate of copper under voltaic action from five to fifteen days. But this system, although suitable for wrought-iron small castings, failed when applied to large surfaces of cast-iron. Cavities not completely coated by the action of the first bath were attacked by the strongly acidified solution of the second; and this being the only kind of bath

capable of throwing a thick deposit of copper on an iron surface, M. Oudry was driven to the conclusion that the direct deposit of copper on large surfaces of cast-iron was impracticable. The method now adopted consists in covering the castings with two coats of oil colour and then dressing them over with plumbago, on which a coating, varying from one-twenty-fifth to one-twelfth of an inch, is deposited—the former thickness being sufficient for all ordinary purposes. The Auteuil works have been in full operation since 1860, and now employ 150 workmen, and consume 3,500 tons of sulphate of copper per year: the two great fountains in the Place de la Concorde alone consumed 850 tons. As regards cost, the Paris lamp-posts, 9' high, bronzed by this system, cost 9*l.*; while a similar one in bronze, half the height, would cost 30*l.* The process is also being applied to armour-plates for the Imperial Navy, which are being coated with a deposit of copper one-twelfth of an inch thick. M. Oudry has also invented a new kind of bronze paint composed of pure copper (thrown down by the galvanic process) and afterwards stamped to powder in a vehicle having benzine for its basis. It is treated like ordinary paint, and the bronzed effects are produced by dressing with acidified solutions and powders of pure copper, a good instance of which may be seen in the balconies of the Theatre Français, which were thus painted about fifteen months since.

GEOLOGICAL SURVEY OF CALIFORNIA.—The progress of this survey seems to be seriously embarrassed by pecuniary difficulties in consequence of the appropriations made by the State legislature being from one to two years behind in payment. Prof. Whitney, the State geologist, reports that with a liberal appropriation—one of not less than \$40,000 a-year—the survey could be concluded in about four years; but under the present condition of affairs he recommends its being altogether suspended until such time as the finances of the State can be placed on a cash basis. He finds that the delay and anxiety caused by the necessity of borrowing to meet the advances required by the treasury too disagreeable and too prejudicial to the interests of the State and the progress of the work, to allow of his being willing to continue the system any longer. It is much to be regretted that a work of such importance, under so competent a director as Prof. Whitney, should meet with such an interruption, which we sincerely hope may be soon removed.

AN IMPROVED AMALGAMATOR.—Among recent Californian inventions is an amalgamator by T. Hansbrow, of Sacramento, the special characteristic of which consists in imparting a compound rotary motion to the mullers, which is effected by the action of a central stationary toothed rim, on pinions secured to the axles of the mullers. By the rapid rotary motion of each muller around its own axis the ore exposed to its action is brought into intimate contact with the mercury; while by the common rotary motion of all the mullers round the central axle the entire contents of the pan are repeatedly and successively exposed to the action of each.

GEOLOGICAL SOCIETY OF DUBLIN.—The anniversary meeting of this Society was held on the 10th of February at the Museum Building, Trinity College, when the following gentlemen were elected as honorary officers and council for the ensuing year: *President*—Rev. H. Lloyd, D.D., F.R.S., Vice-Provost, T.C.D. *Vice-Presidents*—Robert Callwell, Esq.; J. Beete Jukes, M.A., F.R.S.; Rev. S. Haughton, M.D., F.R.S., F.T.C.D.; Sir R. Griffith, Bart., LL.D., F.G.S.; John Kelly, Esq. *Treasurers*—Gilbert Sanders, Esq.; F. J. Sidney, LL.D. *Secretaries*—Robert H. Scott, M.A.; Robert S. Reeves, M.A. *Ordinary Members of Council*—James Apjohn, M.D., F.R.S.; Lord Talbot de Malahide, F.R.S.; John B. Doyle, Esq.; Alexander Carte, M.D., F.L.S.; William H. Baily, F.G.S., F.L.S.; Alphonse Gages, M.B.I.A.; William Andrews, Esq.; B. B. Stoney, C.E.; John Barker, M.B.; Samuel Downing, LL.D.; John Good, Esq.; W. B. Brownrigg, Esq.; Cap-

tain Meadows Taylor; W. Frazer, M.D.; Edward H. Bennett, M.B.—On the call of the President, Mr. R. H. Scott, one of the Secretaries, read the annual report, by which it appeared that a series of really valuable papers had been read before this most rising Society during its last, 32nd, session. Among those papers bearing on subjects within the scope of this *Magazine* we may mention one by Dr. T. Sterry Hunt, of Montreal, "On the Chemical and Mineralogical Relations of Metamorphic Rocks," read in April, and noticed by us in July (No. 19); one by the Rev. M. Close "On Slickensides," in which the author showed, from a careful examination of phenomena of this nature in the granite near Dublin, that the ordinary explanation given in text books was quite insufficient to account for the appearances presented; and another by Professor Haughton "On Joints," also referred to in our July number.

AMERICAN CRUSHING MACHINE.—At the anniversary meeting of the Institution of Mechanical Engineers held at Birmingham on January 28th, a paper was read by Mr. J. Lancaster, on a machine for breaking limestone and ore, in use at Kirkless Hall Ironworks. This machine, the invention of Mr. Blake, of Connecticut, consists of a hopper, in which the stone is broken between a pair of jaws, one fixed in the frame of the machine, and the other vibrating on a centre through a short distance, worked by a long lever, moved by a crank-shaft driven by steam power. The crushing faces of the jaws are grooved with alternate corrugations, and the vibrating jaw is suspended at a small inclination to the fixed jaw, and is pressed forwards a short distance at each stroke, by which a very powerful crushing action is obtained. The frame of the machine is of cast-iron, of great strength. The material to be broken is fed in at the top between the jaws, by which it is gradually crushed and broken, until it is reduced to pieces small enough to fall out at the bottom of the jaws, the space between the jaws at the bottom being adjusted according to the size to which the stone is required to be broken. The machine is driven at about two hundred strokes per minute, and the quantity of limestone broken is about one hundred tons per day, or ten tons per hour. It is found to have special advantages in its strength of construction, and in the small amount of wear and tear, in consequence of the parts subjected to the severe crushing strain being simple pressure pieces of cast-iron, of an advantageous form for strength, and having large bearing surfaces with small extent of motion upon them. The only parts exposed to wear are the two plain cast-iron jaws, which are readily replaced. [Machines of this description have been for some time in very general use all through the United States and British North America, where they are properly called "Macadamisers."—Ed. M. & S. M.]

INDURATING IRON AND PROTECTING IT FROM OXIDATION.—Mr. J. Webster proposes to effect this in the following manner. The indurating compound consists of about equal proportions of carbonate of potash and American ash pulverised and mixed together, to which hydrochloric acid is added until carbonic acid gas ceases to be given off, when the mixture is put into a close vessel or retort, and heated to drive off the water and reduce the mass to a homogeneous liquid state, after which it is run off and cast into blocks, which become solid on cooling. This mixture (which may be called No. 1) is roughly pulverised and added to prussiate of potash (also roughly pulverised), in the proportion of 17% of the former to 83% of the latter, and the whole melted in a close vessel and cast into blocks, which, however, must be again liquified for use, and which may be called No. 2. The metal to be treated is heated to a bright red heat, and dipped into preparation No. 2, and then left to cool, when the hardening process is complete. For protecting from oxidation, a varnish is prepared consisting of 50% of paraffin oil, 15% of naphtha, 3% of tar, about 3% of mixture

No. 2 in a pulverised state, 20% of rosin, and about 10% of tar oil. This preparation answers for rough articles, but for finer articles it will be found advisable to add a small proportion of gutta percha with sulphide of carbon in addition to the naphtha as its solvent.

GEOLOGICAL SOCIETY OF LONDON.—At the anniversary meeting of this Society on the 19th February, Mr. W. J. Hamilton, F.R.S., was elected President in the room of Professor Ramsay, and Dr. P. M. Duncan, so well known for his papers on corals, as Secretary, in the room of Mr. Hamilton. The Wollaston Medal was awarded to Sir Roderick Murchison, K.C.B. It may be considered remarkable that this honour had not previously been conferred on a geologist of such pre-eminent position; but the fact is no member of the Council for the year is eligible to receive it, and, as Sir Roderick had been on the Council uninterruptedly for a great number of years, he was consequently ineligible until the last year, when he happened accidentally to be off the Council. We may mention that the Presidency is understood to have been offered in turn to Mr. Godwin-Austin and Mr. Prestwitch, both of whom were prevented, by private engagements, from undertaking the office.

MINERS' SAFETY LAMPS.—Mr. J. Brooke proposes to apply to the miners' safety lamp a wick and burner adapted to burning paraffin, petroleum, or other mineral oils instead of the animal oil, at present employed, by which a very superior and economical light is obtained, and the fine wire gauze now placed around the flame of the lamp is dispensed with. The cold air is admitted through adjustable air spaces into a circular air chamber screwed to the oil pan below the flame of the lamp; inside which chamber circular wire gauze plates, or wire gauze cylinders, one within the other, fitted around the external circumference of the air chamber, are placed for the cold air to pass through before coming to the flame. Above the air chamber to which it screws, is the bottom flange plate, through the centre of which the wick-tube and burner project from the oil pan below. This plate supports the glass chimney and cylinder (the latter with air-tight connections); and on its upper side four equidistant metal pillars are fixed, by which the top flange-plate is supported, resting (also air-tight) on the top of the glass cylinder. The upper part of the glass chimney, which projects through this top flange-plate into wire-gauze caps, has a metal chimney to protect it from cold currents of air, and to increase the draught.

MANUFACTURE OF IRON.—Mr. W. H. Dawes, of Bromford Iron Works, West Bromwich, proposes improvements in the manufacture of iron, the first of which consists in introducing such a quantity of refined iron in a melted state into the puddling furnace as will be sufficient to make only one ball of iron of about 120 lbs. weight; the skill and labour of the puddler required to separate the larger quantity commonly made use of into four, five, or six balls being thus in great part dispensed with. A second improvement consists in connecting the processes of the blast-furnace, the refinery and the puddling furnace, so that the iron from the blast-furnace may be run direct into the refinery, and when sufficiently refined, conveyed into the puddling furnace by means of ladles or other means suited to the purpose.

The total number of patents applied for during 1863 was 3,309, of which 21 referred to metallurgical operations; 40 to working mines and raising minerals; 22 to reducing smelting ores; 33 to iron manufactures; and 25 to steel manufactures.

The President of the Board of Trade has appointed Messrs. John Thomas Hobson, Alfred E. Fletcher, Brereton Todd, and Charles Blather-

wick, to be sub-inspectors of alkali works, in conformity with the provisions of the Act 26th and 27th Vict, cap. 124.

A German translation of the last edition of Truran's Treatise on the Iron Manufacture of Great Britain, edited by Messrs. J. Arthur Phillips and W. H. Dorman, has been just published by Voigt of Weimar, under the superintendence of Dr. C. Hartmann. The German critics, while recognising the valuable details of the author's great personal experience, strongly comment on the extraordinary want of system shown in the arrangement of the matter, which so seriously impairs its value.

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Patents relating to Mining and Metallurgy.

(Compiled from Commissioners' Patents' Journal.—Subject matter only given.)

UNITED KINGDOM.

APPLICATION FOR PATENTS FROM JAN. 26TH TO FEB. 19TH.

- 218 (1864). G. DARLINGTON, Manufacture of zinc white.
- 234 (1864). W. T. BURY, A new material for forming moulds for casting steel and other metals.
- 265 (1864). H. BESSEMER, Manufacture of armour-plates.

- 266 (1864). W. E. NEWTON (com. from N. BASSETT), Manufacture of aluminium.
- 267 (1864). J. G. JONES, Machinery employed when getting coal, stone, and other mineral.
- 315 (1864). W. TAYLOR, W. MOLINEUX, and H. HARRISON, Improvements in puddling-furnaces for the manufacture of iron.
- 338 (1864). W. C. STOBART, Improvements in coke ovens.
- 341 (1864). B. TODD, Compositions to be used to prevent the oxidation of iron.
- 343 (1864). F. W. WEBB, Manufacture of railway rails.
- 346 (1864). P. SPENCE, Manufacture of sulpho-cyanide of ammonium and other sulpho-cyanides.
- 351 (1864). M. C. DE CASTERAS SINIBALDI, Coating iron and steel with copper, brass, or other metals.
- 358 (1864). G. DAVIES (com. from J. SMITH and J. R. SAVAGE), Manufacture of sulphuric acid.
- 369 (1864). J. HENDERSON, S. C. CHILD, and W. L. DUNCAN, Improvements in rails for railways and tramways.
- 372 (1864). W. DRAKE, Manufacture of iron.
- 389 (1864). G. BOHN, An improvement in cowl for shafts.
- 399 (1864). F. C. P. HOFFMAN, Machines for washing and crushing ores and minerals.
- 418 (1864). L. S. NAUDIN, Preparation of a substance for soldering silver and other metals.
- 430 (1864). G. H. JOHNSON, A new method of constructing blast and cupola furnaces.

PATENTS SEALED FROM FEB. 2ND TO FEB. 16TH.

- 2012 (1863). E. B. WILSON, Improvements in blast-furnaces.
- 2080 (1863). R. GRIFFITHS, Construction of retorts for extracting oil from coal and other bituminous substances.
- 2837 (1863). T. HARRISON, Machinery for excavating coal and other minerals, applicable also to other mining purposes.
- 2021 (1863). G. YATES, Apparatus for indicating the quantities of coal and other substances drawn from mines.
- 2448 (1863). E. JONES, Apparatus for pumping water from mines and other places.
- 2659 (1863). W. and S. FIRTH, and J. STURGEON, Machinery for cutting and boring coal, stone, or other minerals.
- 2760 (1863). W. D. ALLEN, Improvements in casting ingots of steel.
- 2086 (1863). R. A. BROOMAN (com. from H. MICOLON), A new metallic alloy.
- 2122 (1863). G. DAVIES (com. from A. L. FLEURY), Manufacture of iron and steel from cinders of puddling-furnaces.
- 2277 (1863). J. McEWEEN, Coke and hot-blast apparatus.

PATENTS ON WHICH £50 DUTY HAS BEEN PAID, FROM JAN. 28TH TO FEB. 16TH.

- 275 (1861). H. BESSEMER, Manufacture of malleable iron and steel.
- 333 (1861). C. WHILE, Improved rolling machinery for rolling iron and other metals.
- 486 (1861). J. YOUNG, Apparatus for the treatment of bituminous substances.
- 455 (1861). R. MUSHET, Manufacture of cast-steel.
- 473 (1861). R. MUSHET, Manufacture of cast-steel.

PATENTS VOID BY NON-PAYMENT OF DUTY, FROM JAN. 16TH TO FEB. 13TH.

- 209 (1857). J. F. POWELL, Improvements in reverberatory furnaces.
- 195 (1861). D. J. FLEETWOOD, Apparatus for rolling metal.
- 196 (1861). W. LONGMAID, Manufacture of iron and steel.
- 203 (1861). J. LAW, Improvements in shutting off the steam and operating upon the breaks of engines employed in lowering into and lifting from mines.

- 236 (1861). W. SMYTH and M. WASLEY, Apparatus for crushing ores.
 262 (1861). I. ROGERS, Furnaces for treating iron ores.
 317 (1861). T. BANKS and T. MORGAN, Improvements in casting plates of iron with lead or tin, or alloys of lead and tin.
 335 (1861). A. LEIDEMANN and T. LANGE (com. from L. BEUMLEN), The manufacture of sub- or oxo-sulphate of lead.
 356 (1861). W. GORBETT, Arrangement and construction of puddling and heating-furnaces employed in the manufacture of iron and steel.
 373 (1861). J. POOLE, J. WRIGHT, F. S. HEMMING, and G. SEARBY, Improvements in drilling, boring, or excavating rock and other earthy substances.
 354 (1857). J. N. V. CADIAT, Application of centrifugal force in purifying minerals, and other similar hard substances, by washing.
 373 (1857). J. HARDING, Treatment of metallic ores.

AUSTRIA.

PATENTS GRANTED, PROLONGED, AND BECOME VOID DURING NOVEMBER.

555. A. NOBEL, Manufacture of gunpowder for blasting. [Granted.]
 427. E. RZIHA, Electric matches for blasting rocks. [Prolonged.]
 507. M. EVERARD, Machine for conglomerating small coal. [Become void.]
 513. J. JACOB and F. KÖLLER, Applying tungsten metal and its chemical compounds to metallurgical purposes. [Become void.]
 514. C. WAGNER, Using gas in metallurgy. [Become void.]
 546. F. SALZBURGER, A rotary or swing puddling furnace. [Become void.]

BADEN.

PATENT DELIVERED IN 1863.

25. C. G. CLEMM, New process for the manufacture of sulphur, sulphuric acid, sulphate of potash, sulphate of soda, soda, potash, chloride of potassium, and muriatic acid, and utilising the sub-products obtained thereby for the manufacture of other chemical products.

BELGIUM.

PATENTS DELIVERED FROM JAN. 31ST TO FEB. 15TH.

- 15,556. H. P. BURT, S. B. BOULTON, and J. B. HAYWOOD, Increasing the strength of metals.
 13,530. A. BOITELLE, Charring timber for mines.
 15,605. P. M. SALOMON, Simultaneous manufacture of steel and ammonia.
 15,623. D. S. SUTHERLAND, Cartridges for blasting rocks.
 15,649. J. LEFEVRE, Repairing twyers of blast-furnaces.
 15,653. N. BASSET, Manufacture of aluminium.
 15,654. E. MINARY, Treatment of slags of blast-furnaces for agricultural purposes.
 15,663. E. VINCENT, Improved glasses for miners' lamps.
 15,686. L. ALOND, Manufacture of sulphur and sulphureous acid.

FRANCE.

CURRENT LIST OF PATENTS.

- 60,081. I. FRAISSINET and BAUX, Applying coal and lime in treating and purifying petroleum.
 60,141. MUSHET, Treatment of pig-iron.
 60,170. PARENT, SCHAKEN, CAILLET, and Co., A drum with a double casing for sorting granular substances, and especially ores.
 60,182. BESQUEUT, Carbonising and torrefying coal and other substances.
 60,217. GERHARDT, Manufacture of iron and steel.
 60,218. GERSTENHOEFER, A furnace for roasting ores.
 60,228. MUSHET, Moulds for casting steel and homogeneous iron.

- 60,229. NOBEL, Manufacture of gunpowder for mining.
 60,272. BOIGUES, RAMBOURG, and Co., Apparatus for washing coal.
 60,287. KRAFFT and LELONG-BURNET, Manufacture of baryta salts.

UNITED STATES.

PATENTS ISSUED FROM JAN. 12TH TO FEB. 9TH.

- 41,307. B. LAUTH, Improvements in rolls for rolling metals.
 41,376. C. B. GRUBB, Improved furnace for roasting ores.
 41,565. S. W. WOOD, Improvements in separating and collecting gold and silver amalgams.
 41,585. J. B. WAYNE, Improvement in rock-breaking machine.

SPECIFICATIONS PUBLISHED, AND PRICES.

FROM JAN. 23RD TO FEB. 20TH.

** Specifications will be forwarded by post on receipt of price and postage at Her Majesty's Patent Office, 25, Southampton Buildings, London, W.C.—The amount of postage may be estimated from the price, as follows:—Where price does not exceed 1s. 6d., postage will be 1d.; above 1s. 6d., and not exceeding 3s. 4d., it will be 2d.; above 3s. 4d., and not exceeding 6s. 4d., it will be 4d.—Sums exceeding 6s. must be remitted by P. O. O., on Holborn Office, payable to *Bennet Woodcroft*.

- 1,405 (1863). W. CLARK (com. from J. T. COUPIER), Distilling and separating hydrocarburets and their derivatives; 1s.
 1,420 (1863). J. G. JONES, and R. RIDLEY, Working coal and other mines; 1s.
 1,433 (1863). R. A. BROOMAN (com. from J. SAUNDERS), Distilling bituminous substances; 4d.
 1,444 (1863). J. BROOKE, Miners' lamps; 4d.
 1,456 (1863). J. WEBSTER, Indurating iron; 4d.
 1,470 (1863). G. BEDSON, Cupolas and blast-furnaces; 8d.
 1,513 (1863). W. H. DAWES, Manufacture of iron; 4d.
 1,519 (1863). F. DE WYLDE (com. from H. SCHWARZ), Preserving lead surfaces from decomposition; 1s.
 1,530 (1863). R. JOBSON, Manufacture of moulds for casting metal; 1s. 4d.
 1,564 (1863). J. McLEAN, Treating mineral oils; 4d.
 1,580 (1863). T. F. PARSONS, Preparing plates or bars of iron for being coated with metals or alloys; 4d.
 1,602 (1863). R. MUSHET, Manufacture of iron and steel; 4d.
 1,612 (1863). J. GRIFFITHS, Puddling iron and steel; 1s. 4d.
 1,613 (1863). R. MUSHET, Manufacture of iron and steel; 4d.
 1,604 (1863). H. G. CRAIG, Preparing iron and other metal plates for ship-building; 1s. 10d.
 1,638 (1863). R. C. CLAPHAM, Manufacture of hyposulphite of soda; 4d.
 1,639 (1863). J. H. JOHNSON (com. from X. F. GIBARD), Coating metal sheets with metals or alloys; 10d.
 1,646 (1863). R. A. BROOMAN (com. from BARONESS DE LAVENANT), Compositions for protecting metals and metallic articles from oxidation; 4d.

Current Review of Mining, Quarrying, and Metallurgy.

CORNWALL, DEVON, AND WEST SOMERSET.

OUR sanguine expectations with respect to the copper standard have not been realised, for it has declined fully 5 $\frac{1}{2}$ the last month, notwithstanding cheaper money. In tin there is no alteration; indeed it is difficult to say what the standards are very exactly, so unsettled is the trade. Underselling, however, seems to be put an end to, for the present at least.

In the mines themselves there are no very striking alterations; any that

have occurred are noticed below. The only feature worth remark is the seemingly infinite multiplication of the Grylls and Chiverton families, under the fostering auspices of the London brokers. The difficulty soon must be to find names—for all the cardinal points of the compass are exhausted, and Consols, United, Great, New, Central, Hill, and Valley will be soon gone. One new company has been driven to the extremity of calling itself *Wheal North Grylls*, there being, we suppose, a *North Wheal Grylls* already in existence.

The quarterly sittings of the Stannaries Court commenced on Feb. 17th, when petitions for winding-up *South Wheal Clifford*, *West Providence*, and *Wheal Cherry* mines were presented.

Prosper United is opening up very well; the lode in the 80 west of Louisa's is worth 2½ tons of ore per fathom, and the 70 east on the new lode is worth 6 tons per fathom. At *Great Wheal Fortune* they have intersected an apparently new lode, in cross-cutting at the 29-fathom level; it is 2' wide, and worth 30l. per fathom for tin and copper. The bottom end, east of Painters, has become poor, being home of the cross-course. *Treloweth* is looking better at several points. The lode in the 134, east of sump-winze, is said to be worth 25l. per fathom, and the lode in the 144 west worth 20l. per fathom. The boundary shaft at *New Trevenen* has improved to good stones of tin, with favourable indications. At *Treworthis* there are several points of importance to come off. At *East Lovell* the lode in the shaft is reported to be worth 100l. per fathom for 12' long. *Wheal Curtis* is reported to be looking better generally. A branch of tin has been discovered at *Grylls Wheal Florence* in the cross-cut driving in the 19-fathom level to cut Fisher's lode. *Wheal Kitty* (St. Agnes) continues to be steadily opened up, and is reported to have improved the 65 east being worth 30l. per fathom.

Wheal Grenville seems at last to have gained a really sound position as a tin mine; and those best acquainted with the district consider it will be in a position to make excellent returns when the machinery is completed. *North Crofty* is looking very well. The 170 east is worth 40l. per fathom, and the 170 west is much improved in appearance. The 160 east is worth 40l. per fathom. Prospects at *Wheal Seton* are again improving. The sump-winze is worth 15 tons, and going better, and Tilly's shaft continues in a good lode, worth 12 tons per fathom; other points of operation are also on the whole looking better. At *West Seton* the lode in the 110-fathom level, 102 fathoms west of shaft, is yielding 5 tons of copper-ore per fathom, and the ends in the aggregate are worth 35l. per fathom for tin. At *Wheal Uny* the south part of the lode cut into, east of the engine shaft, is now worth 30l. per fathom. The bottom level, west of No. 3 shaft, is also improving, worth 15l.-20l. per fathom. The boundary shaft at *Copper Hill*, sinking under the 80, shows good stones of ore. At *Wheal Buller* a lode or branch has been cut-in in the 70 cross-cut north, worth 25l. per fathom. A lode worth 20l. per fathom for copper has been cut in King's shaft at *North Downs*. At *St. Day United* Opie's shaft is sinking in a good course of tin; the 184, east of Opie's, is worth 50l. per fathom. *South Crofty* is looking well, the shafts and levels being worth in the aggregate 74l. per fathom. At *Crane* the shaft sinking on the Briggan lode has a promising appearance. *Great Wheal Busy* is looking very well. The lode at the engine shaft is worth from 25l.-30l. per fathom. *Boscawen* mine, adjoining, is also looking well, the 70 west being worth 40l. per fathom.

At *West Chiverton* the bottom of the mine is looking well. Valpy's lode, in the 80 west, is worth 40l. per fathom, and the 80 west on Williams' lode is worth 100l. per fathom. At *Wheal Chiverton* Cookney's engine shaft is sunk 40 fathoms from surface in a good channel of ground.

At *East Caradon* it is reported that the caunter lode in the 80 cross-cut is cut into about 3', but not cut through, and is worth for that distance 20l. per fathom. The south lode has also been cut in the 70 cross-cut

north, worth about 45*l.* per fathom. At *Gonamena* the lode in the 170 west is reported to have greatly improved in appearance, being worth 46*l.* per fathom. In the 160 east the lode is worth 40*l.* per fathom. The south lode at *Wheal Hope* is said to have been intersected in the 48 cross-cut, yielding good leady work.

At *East Russell* the lode in the 120, east of Viger's cross-cut, is said to be 5' wide, and of a promising character. In the lead mines of the Christow district *Frank Mills* is reported to be looking very well. At the neighbouring mine of *South Exmouth* a deposit of carbonate of lead is said to have been intersected.

At *East Lovell* meeting (on Jan. 26th) Sir William Smith stated that he had purchased upwards of 700 shares, but that up to that time only 205 had been delivered to him. At *Dolcoath* meeting (on Feb. 8th) Mr. Sampson Waters was elected a member of the committee in the place of the late Mr. R. Lanyon.

Among the prospectuses of new undertakings issued during the month have been: the *West Clifford United Tin and Copper Mining Company*, with a capital of 30,000*l.*, in 6,000 shares of 5*l.* each, the object of which is to work the old Ting Tang mine and Wheal Moyle. The latter has been worked recently and proved a disappointing failure; but old Ting Tang is generally considered to be a fair speculation, although its last working was most disastrous. This mine seems to have been originally worked, to the 110 and 140 below adit, by the Messrs. Williams of Scorrier, from 1820 to 1833, during which period it is stated to have realized 40,000*l.* profit. When stopped by this party the bottoms were of course poor, but there was one promising point in the 140 where a great gozzan lode, 13' wide, was letting down quantities of hot water. The last working was commenced in 1847, under the management of the late Captain William Martin, and ended in a loss of 30,000*l.*; but although this large sum was sunk the mine really received no trial, although there was a good body of shareholders, including the then Deputy-Governor of the Bank of England. The present board is an odd mixture of names, but it includes that of Mr. F. M. Williams, eldest son of Mr. Williams of Tregulrow, and a partner in the tin-smelting firm of Messrs. William, George, and F. M. Williams. The other Cornish names are Mr. T. E. Lanyon of Kennal Vale, Mr. Francis Pryor of Redruth, and Mr. Richard Michell of Littlebeside. The London names are the well-known projectors of St. Just Consols and other mines. From the prospectus it appears that 10,000*l.* is to be paid for the sett—5,000*l.* in cash and 5,000*l.* in shares. It is clear that the leading people in Cornwall are fast getting rid of their old prejudices against "limited" companies, charging large premiums for setts, since we see the leading firms putting forward their junior members as directors in such companies; for instance Mr. F. M. Williams in this case, and Mr. Edward Brydes Willys in that of Crenver and Abraham, where the premium charged was 9,500*l.* The *Cape Cornwall* (St. Just) Consolidated Tin and Copper Mining Company, with a capital of 20,000*l.*, in shares of 2*l.* 10*s.* each, and the purchase money for the leases for 21 years, and the benefit of the work done, has been fixed at 8,750*l.*, of which 2,500*l.* is to be paid in cash, and the remainder in paid-up shares. This is another instance of a large premium being paid. The *Central Grylls Mining Company*, with a capital of 6,000*l.*, in shares of 3*l.* each. This Company is the same as that announced in our January number, under the title of Grylls Tin Mining Company. There is also the *Grylls Consols Tin Mine*, divided into 2,048 shares, and to be conducted on the cost-book principle.

The consumption of timber in Cornwall approaches 100,000 loads a year, and involves an expenditure for Norway timber alone of nearly 200,000*l.* Large quantities of American timber are also used, in which it is estimated there is an annual expenditure of 40,000*l.*

WALES AND THE BORDERS.

SOUTH WALES.—There has been great activity in the iron trade, the works having been fully employed, and prices firmly maintained. During the early part of the month, the puddlers and other operatives gave notice for a further rise of 20¹/₂%. The masters have agreed to give them an advance of 10¹/₂%, which makes a total advance of 25¹/₂% within the last four months. It is stated that some attempts have been made in Monmouthshire to establish an union in conjunction with the Staffordshire and North of England miners, but the miners of South Wales do not seem very anxious about it, as all former unions have turned out to the injury of the men.

A vein of iron ore is said to have been discovered at *Broadhaven*, Pembrokeshire, and a lease has been taken of that portion of Lord Kensington's property in which the ore has been found. It is stated that the *Pembrokeshire* Iron and Coal Company are about to blow in their furnaces at Kilgetty, and that one is nearly ready for going to work.

The *Abernant* Iron Company are, it is said, preparing to put the furnace, which has recently been undergoing repairs at *Llwydcoed*, into blast again, and additional hands will thus be shortly employed. The directors of the *Mwyndy* Iron Ore Company intend erecting several blast-furnaces on their property at *Llantrissant*, in order more fully to develop the iron ore deposits of the estate. Owing to the activity in the iron trade, a large quantity of ore has been raised of late, and higher prices have been realised.

It is reported that some veins of red hematite have been discovered on the property of the *Wenvoe* Red Hematite Iron Ore Company, near Cardiff, which are expected to give good results.

On February 17th a boiler explosion occurred at the *Aberaman* Works, Glamorganshire, the property of Mr. Crawshay Bailey, M.P., resulting in the death of seven men and seriously injuring many others. Much injury was also done to the works. The cause of the accident is not yet known.

There has been some agitation in connection with the coal trade on account of the advance of wages required by the colliers, and on the whole a very active business has been done in the market, both for home use and for export, indeed the demands have been so large that many of the collieries have with difficulty been able to meet them. The question of wages has not yet been settled, but in some of the districts the colliers have already received an advance, and it is hoped that it will soon be satisfactorily arranged.

The coal-get throughout the *Aberdare*, *Merthyr*, and *Llanwunno* coal-field during the year 1863 was 3,254,975 tons. Of this quantity *Aberdare* produced 2,148,969 tons; *Merthyr*, 812,778 tons; and *Llanwunno*, 293,228 tons.

During the month of January 390 vessels were engaged in the trade of Swansea, with an aggregate registered tonnage of 50,591 tons, and the shipping dues received amounted to 1,233*l.* 4*s.* 5*d.*, against 332 ships, 43,658 tons tonnage, and 1,125*l.* 8*s.* 11*d.* shipping rates in the corresponding month of last year. The increase in the trade is mainly due to the reduction in ballast tolls and other important modifications which came into effect on the 1st of January; 165 vessels, with a registered tonnage of 13,387 tons, were engaged in the trade of Neath and Briton Ferry, and 17,303 tons of coal, coke, and culm, 856 tons of bar iron, and 273 tons of tin plates were exported during the month. The imports were 4,254 tons of copper ore, 1,843 tons of pig-iron, 1,630 tons of iron ore, being an increase of 1,813 tons on the corresponding month of 1863. The exports showed an increase of 3,770 tons. A large trade was also done at *Llanelly* during the month.

The arrivals into Swansea during the past month include: Copper ore from *Genoa*, *Aveiro*, *Caldera*, and *Cuba*; lead ore from *Aveiro*; copper

regulus from Caireval Baji, and Cuba; iron ore from Cherbourg; and nickel ore from Langesund.

The returns of the bill of entry at Cardiff show that in the month of January 117,000 tons of coal, 14,000 tons of iron, 1,100 tons of patent fuel, and nearly 1,000 tons of coke were exported. The total number of vessels engaged in the trade of the port was 580, out of which 298 cleared foreign. The exports of coal show a considerable falling off, not, however, in consequence of the demand lessening, but because of the irregular manner in which the colliers work. The exports of iron have largely increased as compared with previous months, and the imports of iron ore, pig-iron, &c., are also increasing.

The new undertakings during the month have been:—The *South Wales Colliery Company*, with a capital of 200,000*l.*, in 8,000 shares of 25*l.* each, propose to lease or purchase coal-fields in the South Wales basin, and to work the collieries for export and home consumption, in consideration of the great and increasing demand, both at home and abroad, for South Wales coal, for steam and other purposes. A lease for fifty years has been obtained of extensive seams of coal in the barony of Abergaveuny, described as identical with and forming a portion of those now worked with great success by the *Blaenavon Company* and other coal-owners. The *Glamorgan Iron Ore Company*, with a capital of 40,000*l.*, in 8,000 shares of 5*l.* each, to work an estate of argillaceous iron ore near Briton Ferry Docks, and the ironworks of the neighbourhood. The purchase-money for the lease is 12,400*l.*, which is to be partly taken in shares.

GLoucestershire.—The prospectus of a new company called the *Titanic Steel and Iron Company* (Limited) has appeared. It has been formed for the purpose of working (and granting licenses to use) the processes for improvement in the manufacture of steel and iron invented by Mr. Robert Mushet, of Coleford. The nominal capital is 360,000*l.*, in 2,000 shares of 100*l.* each (of which only 400 are to be created), and 16,000 shares of 10*l.* each. The works at Coleford, purchased by the Company from Messrs. R. Mushet and Co., are undergoing extensive additions, which are being rapidly pushed forward. It is officially stated that the accounts for the last six months will show that, notwithstanding the unfinished state of the works, sufficient has been earned (exclusive of royalties receivable by the Company) during that period to pay a dividend at 6*%.* per annum upon the proprietor's capital. We should be glad to hear of the attention of the company being practically directed not only to the manufacture of steel, but also to the making of iron itself, for steel purposes, for which the ores of the district seem peculiarly adapted.

The imports into Bristol include:—20 barrels of sulphur from Liverpool; 130 tons of sulphur ore from Arklow; 250 tons of lead ore from Sardinia; 100 tons of silver lead ore from Douglas; 365 pieces of pig-iron from Archangel; and 168 tons of sulphur ore from Pomaron. During the month of January but little trade was done in the export of coal and iron. The shipments comprised only 160 tons of coal, and 87 tons of iron, against 687 tons of coal, and 1,507 tons of iron exported in December, 1863, showing a decrease of 527 tons of coal, and 1,420 tons of iron.

Among the imports into Gloucester were:—60 tons of coal from Llanelli. The exports comprise:—347 tons of iron, and 265 tons of burnt ore.

NORTH WALES.—The *Vigra and Clogau Mining Company* have received 629 oz. 5 dwts. 22 grs. of gold for the three weeks ending February 13th, being the produce from 26 cwts. 1 qr. 23 lbs.

A new company has been formed called the *Quedlyn Slate Quarry Company*, with a capital of 20,000*l.*, in shares of 5*l.* each. The object is to develop a slate quarry, about eight miles from Carnarvon, which has already been opened, and proved to contain slate of superior quality.

MIDLAND COUNTIES, SOUTH LANCASHIRE, AND SOUTH YORKSHIRE.

STAFFORDSHIRE AND WARWICKSHIRE.—The iron trade has not manifested the same amount of briskness which has characterised it during the last few months. There has been a fair demand for hoops and sheets, but for bars orders have been very limited. On the whole, however, a fair amount of business has been transacted, and prices have been well maintained.

The coal trade has been exceedingly active, and the supply has been quite unequal to the demand. Prices have been very firm, with a tendency to rise in those cases where the colliery proprietors have been obliged to give higher wages than formerly. A meeting of coal-masters who have mines in the Wolverhampton district was held in that town on February 17th. It was known that some men were still "out" for a rise of sixpence a day, and that others were only awaiting the success of their partial strike to make similar demands; and the masters, after again discussing the matter, came to a firm resolve not to give more than threepence a day rise, making thick-coal colliers 2s. 9d. a day. How they could give more and keep the trade in the district was a problem; for already the high prices of coal and the short supply occasioned by the irregularity with which the men work have given occasion for iron-masters to seek much of their supplies out of the district.

A new company has been formed, called the *North Stafford, Steel, Iron, and Coal Company*, the object of which is the manufacture of Bessemer steel and finished iron, and the development of two mineral properties known as the Rushan Grange, and Dog Croft estates, the deposits on which are said to be of great extent. A contract has been arranged with Messrs Royle and Martin, two of the directors of the company, for the purchase of the leases, machinery, engine, &c., for the sum of 20,000*l.*, the vendors receiving 5,000*l.* in cash and the balance in shares, upon each of which 10*l.* only is to be considered as paid. The capital is 200,000*l.*, in 10,000 shares of 20*l.* each.

DERBYSHIRE.—There has been no falling off in the activity of the iron trade. The demand for rails for the Continent and for India has been very large, and all the works have been well supplied with orders. The steel trade is also increasing, some good orders having been sent from the Russian and French markets.

The coal trade has also shown considerable briskness, which seems likely to continue. The demand for the London market has been very large. A new company has lately been formed for working a coalfield between Hullfieldgate and Alfreton, which will give employment to a large number of hands.

NORFOLK.—An extensive vein of iron ore has, it is stated, been discovered on the Sandringham estate, the property of the Prince of Wales. It is believed that the deposit covers about 500 acres, and it is expected will prove in time of great importance to the neighbourhood.

LEICESTERSHIRE.—A new pit has, it is said, been sunk in *Ravenstone* Lordship, the coal from which is very good, and will no doubt come into great demand as its great warmth and slow combustion render it very valuable. The sale of lime at Barrow and Breedon is much increasing; it is also reported that there are some fine beds of gypsum at Prestwold, Syston, Thurmaston, and Humberstone.

LINCOLNSHIRE.—It is stated that Messrs. Dawes, of the *Milton* Iron-works, near Barnsley, have taken an extensive track of land on the Lincolnshire side of the river Trent, opposite Keadby, and opened extensive blast-furnaces there. They are making about 500 tons of iron per week. The immense mineral wealth of this locality, which was only discovered

about two years ago, will give employment to large numbers of men, and when railway communication is opened, as it shortly will be, with the Yorkshire side of the river, the new trade will, it is expected, still further be developed.

SOUTH YORKSHIRE.—There has been great activity in the coal trade, though the get of coal has not been so large as might be expected, owing to the unsettled state of the colliers. The masters have had almost more orders in hand than they could execute, the cold weather having so greatly increased the demand. Large quantities of coal are sent weekly to the Lincolnshire ironstone districts from the *Shireoaks* pit near Worksop, it being well adapted for smelting purposes.

Several strikes have taken place in different parts of the district. At *Oaks* Colliery, the largest in South Yorkshire, the men have all turned out, after giving a fortnight's notice, for an advance of 10 % upon their present wages.

SOUTH LANCASHIRE.—The great activity which has characterised the coal trade for some time past still continues, the demand both for home and export having been very large. There has been great agitation amongst the colliers, who are all demanding higher wages. At Messrs. Evans's collieries, Haydock, about 1,500 workmen have struck in consequence of a dispute with their employers, as to how many hours per day they should work. There has also been a strike at the *Gerard Bridge* Colliery, and at the collieries belonging to Messrs. Pilkington.

NORTHERN COUNTIES. NORTH LANCASHIRE AND NORTH YORKSHIRE.

NORTHUMBERLAND AND DURHAM.—The coal trade has shown considerable activity during the past month. The late frosts have kept the collieries working house-coal actively employed, and a brisk business has been done at the steam-coal collieries. The Northumberland and Durham Coal Trade Committee have published their annual report, in which the following results are given for the year 1863, showing a considerable decrease when compared with those of 1862 :—

London.						Coastwise.	
1863	..	..	tons	3,153,180	.. ..	tons	2,921,312
1862	..	..	„	3,224,280	.. ..	„	2,866,329
Decrease .. „				71,100	Increase .. „		54,983
Foreign.						Total.	
1863	..	..	tons	3,797,397	.. ..	tons	9,871,889
1862	..	..	„	4,044,181	.. ..	„	10,134,790
Decrease .. „				246,784	Total decrease ..		262,901

It is reported that the *Stella* Coal Company have commenced working a new pit in their royalty at Ryton and Stella, and that another has been partly sunk in Horsley Wood. It is also stated that the deep pit at Monkwearmouth has again been put into working order.

An accident occurred at *Eshott* colliery, near Felton, on February 12th, by the rope breaking whilst the cage was being drawn up. One man was so severely injured that he died in a few hours.

The tone of the iron trade continues to be very satisfactory, and the demand for shipbuilding has been daily increasing. It is stated that at *Grosmont*, in the Cleveland district, Messrs. Bagnall have completed two new furnaces, which have already produced satisfactory results: it is

estimated that the two furnaces will produce 500 tons of pig-iron per week. It has also been stated that Messrs. H. K. Spark and Co., of Darlington, have taken the ironstone royalties at *Fyrup* on a lease, for the purpose of erecting three large furnaces upon them.

The exports from the Tyne include:—111,408 tons of coal; 12,966 tons of coke; and 27,808 cwt. of iron. Among the imports were:—a cargo of pyrites from Cadiz; 250 bags of iron from Lisbon; 3,700 bars of lead from Almeida; 160 tons of iron ore from Carboneras; and 165 tons of sulphur ore from Pomaron.

SCOTLAND.

The coal trade has been fairly active, and prices have been well maintained. There has only been a moderate request for home use, but the demand for export has been very large. There has been an advance of wages amongst the Glasgow miners, and at several of the collieries the men are now receiving 4s. 6d. per day, which is the rate they demanded, but at others the employers have refused to raise the wages, and the colliers have in consequence struck.

The market for manufactured iron has been very quiet, and in some instances the prices of bars have been reduced 10s. Makers are generally well employed, but chiefly with long standing orders, buyers being unwilling to give fresh ones at the present high prices.

CONTINENT OF EUROPE AND MEDITERRANEAN COUNTRIES.

FRANCE.—The iron trade at St. Dizier has been quiet, although on the whole the demand has been satisfactory. The Buisson and Châtelier works have, it is said, lighted a fourth blast-furnace, which has been constructed so as to be worked provisionally with pure charcoal. It is understood that a Luxembourg iron-master, M. Giraud, has purchased the *Longwy-Bas* furnace, and that he proposes to establish there a large furnace, and also a forge.

The Right Honourable the Lords of the Committee of Privy Council for Trade give notice that the *Moniteur* of 29th January contains a French Imperial decree fixing the duty on coal and coke imported into France, in French vessels and by land, at 12c. per 100 kilos. (décimes included). The above-mentioned decree was to come into force on February 4th.

BELGIUM.—The iron-masters still continue to receive a good supply of orders, and the demand for pig for the rolling works has been increasing during the past month. At the beginning of the month there was a rise in the prices of iron, which was well received, and did not in any way affect the demand. It is stated that the *Ougrée* Ironworks have started a rolling mill for heavy plates and iron for building purposes, and are constructing additional puddling furnaces; it has also been announced that iron works are to be established at *Jemeppe*, and the *Marcinelle* blast-furnace is about to be relighted and carried on by MM. Cornil & Co. It is reported that the *Couillet* Company has decided on increasing its rolling mills, and that five new puddling furnaces, and four reheating furnaces are in course of erection. A new company has been formed, called the *Société Anonyme Houillère de Santa-Ana*, the principal object of which is the working of a coal deposit near Oviedo in the Spanish Asturias.

SWEDEN.—A prospectus has been issued of the *Gellivara* Company, with a capital of 500,000*l.*, in shares of 50*l.* The object is to purchase an estate of 1,200,000 acres in Sweden, containing large and productive beds of iron ore, extensive forests of pine, and a portion of agricultural land

besides saw-mills, furnaces, a ship-building yard, &c. The development of this property, which is to be bought for 225,000*l.*, requires a railway of about 60 miles for the transport of the iron ore to the furnaces and shipping port, and this (including also the construction of two canals) will cost 232,000*l.*, towards which the Swedish Government contribute 48,000*l.* Pending the construction of the railway and canals, which will occupy three years, the vendors of the property undertake that if the receipts of the company fall short of 6%₁₀₀, they will make up any deficiency. About four years back a plan was entertained for this undertaking, but it was brought forward in a less practical shape, and the period was less favourable than at present.

WALLACHIA.—A new company has been formed, called the *Wallachian Petroleum Company*, which has for its object the importation of petroleum from a new source, which is stated to be fully equal to the Pennsylvanian. The project has been formed by a reconstruction of the *Earth Oil Import Company (Limited)*. The advantage of the efficient transport service organised by the old company will thus be secured, together with all the grants and concessions. It is mentioned that "the grantees and contractors are under contract with the company, for fifteen years, to deliver the oil at Ibraila, at 5*l.* per ton, in consideration of their sharing with the company, in equal moieties, the nett profits derived from the sale on this side—an arrangement calculated to insure a large profit to the shareholders, and which will prevent the necessity on the part of this company of any but a very small outlay in plant," and that the supply of oil will be "regular and almost unlimited." The capital is 120,000*l.*, in 12,000 shares of 10*l.* each, the bulk of which has already been taken.

PORTUGAL.—An extraordinary general meeting of the *Portugal Iron and Coal Company* was held on February 16th, for the purpose of obtaining the assent of the shareholders to the conditions upon which the decree of the King of Portugal was granted for allowing the company to carry on its operations in that kingdom. A resolution, ratifying the conditions of the decree, was carried unanimously. It was stated during the meeting that iron ore was being raised from five concessions, and coal from another.

NORTH AMERICA.

NOVA SCOTIA.—A series of glowing paragraphs have been going the round of the papers as to the prospects of the gold-fields of this province, but the information they give is too vague to enable us to form any definite opinion as to their reliability. Besides the *Nova Scotia Land and Gold Crushing and Amalgamating Company* (commonly known in the province as the "English Company"), the only other workings on a large scale seem to be those of Mr. M. D. Field's Companies, which gentleman is, with his American friends, described to be in "perfect extacies."

LAKE SUPERIOR REGION.—The mines of this district are reported to be opening up satisfactorily, and are being vigorously prosecuted. At *Ætna* the Sullivan vein is said to be yielding extraordinary quantities of rich quality ore. The *Phoenix and Bay State* veins still continue very rich, producing large quantities of good ore. At *Manhattan* a vein of ore has been discovered in the greenstone, which seems to promise well in depth.

UNITED (ATLANTIC) STATES.—The supply of petroleum and rock oil is giving out, many of the refineries in Pennsylvania and Canada having stopped work for want of raw material. Crude oil has advanced in price from \$1.50 to \$5 per barrel. There seems in many places to be a sudden exhaustion of the great reservoirs of oil; but sometimes the springs are intermittent, and resume their flow after a short cessation.

The following interesting statistics of the hard anthracite coal product of Eastern Pennsylvania and of the bituminous coal trade of Maryland are abstracted from the *United States Railroad and Mining Register*. In the Schuylkill district the coal carriage of the Schuylkill canal commenced in 1822, when the quantity was 1,480 tons. By 1832 it had reached 209,271 tons; in 1842 it was 491,602 tons; in 1852, 800,038 tons; and last year it amounted to 854,556 tons. The Philadelphia and Reading Railroad did not commence carrying coal until 1841, when the quantity was 850 tons. In 1851 it was 1,650,270 tons, and last year it reached 2,849,408 tons—making a total last year for the Schuylkill district of 53,538,800 tons. In the Lehigh district the quantity carried by the Lehigh canal in 1820 was 365 tons. In 1830 it was 41,750; in 1840, 225,318 tons; in 1850, 690,456 tons; and last year, 699,554. The Lehigh Valley Railroad commenced carrying in 1855, when the quantity was 9,063 tons; the quantity last year was 1,195,155 tons, making a total for the Lehigh district of 1,894,713 tons. The quantity produced in the Wyoming and Lackawanna region in 1830 was 43,000 tons; in 1840 it was 187,835 tons; in 1850, 918,663 tons; and last year, 3,777,417 tons. The total production of hard anthracite during 1863 was 9,376,124 tons. The quantity of bituminous coal produced in Maryland in 1842 was 1,708, in 1862 it amounted to 317,634 tons.

UNITED (WESTERN) STATES.—The property and effects of the *Adventure* Mining Company of Michigan, in the county of Ontonagon, were sold by auction at Pittsburg on January 19th. After a very spirited competition it was purchased for \$110,000 (about 14 000*l.* at present premium of gold). The landed estate of the company consists of 800 acres of mineral land, with machinery. The discovery of silver in *Michigan* continues to attract much attention. The region has been prospected during the past winter, though the deep snows have rendered minute explorations impossible. There are found to be four well defined veins of silver running in a west and south-westerly direction from the lake between Presque Isle and the mouth of Huron Bay. These veins are intersected by cross veins. The silver is found in connection with lead, and in such proportions that it is estimated the lead will pay the expenses of mining. A number of companies already formed are raising capital with which to commence active mining operations in the spring. Specimens of silver lead have thus far been obtained from the following localities: It was first discovered about the middle of last August on the northwest shore of Silver Lake, in town 49, range 29, Marquette county; since which time it has been met with in Presque Isle island where the richest deposits of lead yet found have been discovered, but no silver mixed with it. Rich deposits of silver have also been found in the first tier of townships north of the correction line in the Huron mountain district.

CALIFORNIA AND BORDER TERRITORIES.—The total amount of treasure shipped from San Francisco during the year 1863 by the Pacific Mail Steamship Company was \$41,569,783.67 (about 8,300,000*l.*). Of this only \$10,390,229.66 was sent directly to New York, the remainder, \$31,179,454.01, having been shipped to Panama and England. The *Alta California* gives the shipments of treasure since 1849, and including that year, as follows:—

1849	.. \$ 4,921,250	1854	.. \$51,328,855	1859	.. \$47,664,299
1850	.. 27,476,346	1855	.. 44,640,090	1860	.. 42,303,345
1851	.. 45,582,095	1856	.. 51,042,268	1861	.. 40,639,090
1852	.. 46,586,134	1857	.. 49,340,187	1862	.. 42,380,809
1853	.. 57,331,024	1858	.. 43,897,159	1863	.. 41,569,763

Total \$637,002,534

About £125,500,000.

A good deal of excitement is reported to exist in and about Salt Lake owing to new discoveries of deposits of the precious metals, gold and silver bearing quartz having been found in several localities.

Last advices from *Reese River* state that there are three mills in the Austin Cañon, and three more are being built; but they have lately been almost always idle in consequence of a dispute between the mill men and miners about the price of crushing. They have now, however, settled their differences and gone steadily to work. River mining has this season been protracted to a much later period than usual in consequence of the unusual lack of water in the rivers.

A good copper lode is reported to have been discovered in *Minnehaha Mine*, Carmen Island, the first true well-defined lode hitherto found in that Island. Operations at *Monte Diable* copper mines are progressing steadily, and a good quantity of fair quality ore is being taken out. Encouraging reports have been received from *Humboldt* district where the different works are being vigorously prosecuted.

The *California Copper Smelting Works* at Antioch on the Sacramento River are reported to be going on very well, although of course the furnace cannot work as much ore as the European ones which consume a superior kind of coal.

Reports from *Nevada* are very satisfactory, and the various copper companies are vigorously at work. The *Homestead* Company have struck grey ore at a depth of about 70'; and the *Gray Eagle* Company are putting up an engine to fork the water.

A fine discovery of salt is said to have been made in *Owen's River Valley*, near San Carlos, the only one of any importance yet made in that neighbourhood.

In *Yuba* county a silver lode is said to have been discovered in *Prairie* district, which it is supposed will turn out a very extensive one.

It is said that a really valuable vein of coal has at last been discovered by the *El Dorado* Coal Company, whose claim is situated on *El Dorado Canon*, about ten miles south-east from Dayton. This Company and some others have been prospecting for a bed of coal, supposed to exist in that region, for over a year. The whole thickness of the vein is 9', but the stratum containing the best coal is only about half this thickness. The coal has been tested and examined by good judges, and is pronounced to be of a very good quality.

SOUTH AMERICA.

GRANADA.—The prospectus of the *Frontino and Bolivia* Gold Mining Company has been issued. The capital of the company is 100,000*l.*, in 50,000 shares of 2*l.* each, out of which 35,000*l.* is to be paid for the property—22,000*l.* in cash (17,000*l.* down, and 5,000*l.* on the company realising 10% dividends) and 13,000*l.* in shares. The property includes 5,000 acres of freehold land, with plant that has cost 30,000*l.*; and on this there seems to be numerous large and rich gold-bearing lodes. The manager of the company is to be Captain William Goyen, formerly of St. John del Rey, who has been long and favourably known to us both for ability and integrity; and whose strong reports as to the value of this concern have great weight on our mind in its favour: as a mechanical engineer, his services to a foreign mine are we may say almost invaluable. Considering the extent and character of the property and plant, the price paid seems to us very reasonable; and therefore we are not surprised when we learn that 30,000 shares have been privately subscribed for.

BRAZIL.—The directors of the *St. John del Rey* Mining Company have received, by telegram from Lisbon, the following report, dated Morro Velho, Jan. 17:—Produce for December, 39,696 oitavas; cost for ditto,

10,410*l.*; profit for ditto, 4,904*l.* Produce, 11 days of January, 13,789 oitavas; yield, 6,654 oitavas per ton.

A new company called the *Rossa Grande* Gold Mining Company, with a capital of 100,000*l.*, in shares of 1*l.* each, has issued its prospectus. The property the company proposes to work is the freehold estate of *Rossa Grande*, in the province of Minas Geraes, in Brazil. The city of Sabará, the town of Caeté, and several villages, are within walking distance of the property, and the road from Gongo Soco to Sabará, and the St. John del Rey Mine passes through it. The purchase-money for the fee-simple of the estate and the mills, buildings, and machinery thereon, has been fixed at 30,000*l.*, one-half in cash and the remainder in cash or shares, at the option of the directors. It is estimated that the outlay necessary for the purchase of the property, and to bring the mines into profitable work, will be covered by one-half of the capital.

CHILI.—The *Panulcillo* Copper Company have received letters from their manager to January 1, on which day the company were to become owners of the mine. At that date the seven furnaces were in good order. The make of regulus in the month of December (with the seventh furnace only working twelve days) had been 9,700 quintals, equal to about 450 tons of 35% regulus. The manager expected that this quantity would be exceeded in January. Instructions have been given to increase immediately the number of furnaces, so as to run a larger proportion of the ore raised into regulus.

AUSTRALASIA.

VICTORIA.—The directors of the *Port Phillip and Colonial* Gold Mining Company have received the following advices from Melbourne, giving the results of the month of November last.—Quantity of quartz crushed, 3,096 tons; yield per ton—gold, 10 dwts. 7 grs.; receipts, 2,690*l.*; expenditure ordinary, 1,000*l.*; profit, 1,690*l.*; remittance, 700*l.*

SOUTH AUSTRALIA.—The Australian companies have received reports up to the 26th of December last. From *Kapunda* the directors are advised that the quantity of ore raised in October was 414 tons, of 17% average produce, equal to 70 tons of pure copper, exclusive of 80 tons of sulphur ores for flux. The quantity raised in November is estimated at about 300 tons of good percentage; there had been a shipment of 40 tons copper per Murray, and 20 tons were in course of shipment.

From *Scottish Australian* Captain Holman states that the quantity of ore sampled from the copper mines during the month was 135 tons, being equal to 14½ tons of fine copper. He estimates that the next sampling for West Cadia will rather exceed the past in quantity and be of average quality, while the cost will be less, and that a considerable increase in the yield of ores may be looked for from the Canoblas mine, with little or no addition to the costs. With regard to Lambton colliery, the viewer states that the coal continues in all the places where it is being worked to be of a satisfactory character. The superintendent advises that cargoes had been sent to all the principal ports in Australia and New Zealand, and some had also been sold to various dealers and companies in Sydney, all of whom had reported favourably upon the quality of the coal.

Worthing continues to improve. Ore dressed during the month, 190 tons, former percentage. Regulus sent away, 43 tons. Machinery, &c., going on satisfactorily, although the want of wood is a hindrance just now.

At *English and Australian* there were four furnaces and one refinery at work at Koorunga. At the Port Works the furnaces were let out for a few days for stocktaking and examination by the masons. Since last advices 159½ tons copper had been shipped, together with 95 tons cobbing.

Yudanamutana continues to look well, but there is nothing new to report.

NEW SOUTH WALES.—A bed of clay-iron ore is reported to have been recently discovered in the Illawarra district, between Balli and Coal Cliff. It lies horizontally embedded between sandstone; and the regular Wollongong coal measures lie a few hundred feet below it. The bed of iron ore is about 20' or 35' in thickness. It is also reported that a rich silver mine has just been discovered in the vicinity of Reedy creek, at the base of the Dromedary mountain, about six miles west of the river. The exact locality is kept a secret until the ground has been secured.

A Sydney paper says the coal-trade of the Hunter is likely to be considerably extended before long, as a large firm intend to extend their rail as far as Morpeth, and to put some screw colliers on the colonial line.

Record of the Mining and Metal Markets.

METALLIC-ORE MARKETS.

TIN.—The advance in the standard referred to in our last as not having been officially announced took place on January 23rd, making the standard at the end of that month:—

Superior Fine	..	£115	....	Superior Common	..	£112
Second Fine	..	113	....	Second Common	..	111

In our last number, by the omission of a word, it appeared as if the last advance were included in the standard given, which was not the case as it had not been officially announced.

COPPER.—At the four Cornish sales we give this month, the number of tons, average produce, quantity of fine copper, average price per ton, and standard have been as follows:—

<i>Date.</i>	<i>Tons.</i>	<i>Produce.</i>	<i>Fine Copper. Tons. cwt.</i>	<i>Price per ton.</i>	<i>Standard.</i>
Jan. 28.	.. 3,873	.. 6½	.. 254 13	£6 5 0	£137 1 0
Feb. 4.	.. 3,382	.. 6½	.. 218 6	6 1 0	136 3 0
„ 11.	.. 2,654	.. 6½	.. 169 7	5 16 6	134 6 0
„ 18.	.. 4,664	.. 5½	.. 276 11	5 7 6	137 1 0

The copper standard has declined heavily during the month. At the sale of Jan. 28th, it was stationary; at that of Feb. 4th, it went down 1*l.* 15*s.*; at that of the 11th, 2*l.*; and at that of the 18th, another 2*l.*; making in all a decline of 5*l.* 15*s.*

On the motion of Mr. Humphry Wilyams, at the Ticketing held at Truro on the 18th February, of which due notice was given on the 4th inst., it was resolved that in future the time for commencing the Ticketings should be 11 o'clock a.m., instead of noon as at present. Mr. Wilyams also gave notice that after the 17th March next, the biddings on all mines offering for sale only 50 tons or under (instead of 30 tons or under as at present) should be included in one ticket.

LEAD.—The prices of lead ores have advanced, and indeed have not for a long period, been so high as at present.

COAL MARKETS.

LONDON, *February 26th.*—From the returns of the Registrar of the London Coal Exchange, of the quantity of sea-borne coal, culm, and cinders, imported into London in the month of January, we learn that the total quantity was 288,597 tons, against 273,419 tons during the corresponding month of last year,—showing an *increase* of 15,178 tons.

The following are the particulars of the 288,597 tons imported during January:—

Newcastle ..	118,921	tons in 271 ships	Scotland ..	1,112	tons in 7 ships
Seaham ..	13,471	" 51 "	Wales ..	6,017	" 21 "
Sunderland ..	93,503	" 205 "	Yorkshire ..	1,415	" 16 "
Middlesbro' ..	5,808	" 19 "	Small ..	2,102	" 12 "
Hartlepool ..	44,173	" 147 "	Cinders ..	1,160	" 4 "
Blyth ..	915	" 3 "			

The quantity of coal imported by railways and canals during the month of January was 186,688 tons, against 159,917 tons in the corresponding month of last year,—showing an *increase* of 26,771 tons.

On January 29th, the new ships arrived were 176; a large business was transacted. Hetton Wallsend, 20s.; South Hetton Wallsend, 20s.; Haswell Wallsend, 19s. 6d.; Tees Wallsend, 18s.; Braddyll's Wallsend, 18s. 6d.; Eden Main, 18s.; Belmont Wallsend, 16s. 6d.; Heugh Hall Wallsend, 18s. On February 1st, new ships 87; market active. On the 3rd, new ships 13; market dull; Hartley's 3d. per ton lower. On the 5th, new ships 46; market firmer. On the 8th, new ships 116; an active business was done. On the 10th, new ships 5; a good demand, and large business done. On the 12th, new ships 39; market dull. On the 15th, new ships 32; market dull. On the 17th, new ships 22; a fair amount of business done. On the 19th, new ships 118; a steady business in house coal at full prices. On the 22nd, new ships 29; market active. On the 24th, new ships 16; market steady. On the 26th, new ships 37; market dull; Haswell Wallsend, 18s. 6d.; South Kelloe Wallsend, 17s. 6d.; Heugh Hall Wallsend, 17s. 6d.; Bebside West Hartley, 14s. 6d.; Tanfield Moor, 15s.

LIVERPOOL.—From Messrs. J and T. Platt's Coal Circular for January, we find that the quantity of coal, cannel, coke, and patent fuel shipped from Liverpool to foreign and colonial ports during the month of January was 67,765 tons, against 41,005 tons during the corresponding month of last year—showing an *increase* of 26,760 tons. The exports coastwise during January were 7,716 tons, against 5,415 tons during the same month last year—showing an *increase* of 2,301 tons. The total exports coastwise from January to December, 1863, were 105,178 tons, against 85,036 tons during the corresponding period of 1862—showing an *increase* of 20,142 tons.

CONTRACT FOR COAL.—The Admiralty require the supply of 8,500 tons of South Wales coal, to be delivered at Bermuda.

SHARE MARKETS.

LONDON, *February 26th.*—The upward tendency we noticed in our last has been to some extent maintained, but the decline in the copper standard has checked the rise of the large producing mines, and attention seems to have been principally directed to new and speculative concerns which have been pushed up to a great extent. With the present cheaper money this process may be expected to continue, and a large and feverish speculation may be looked for during the next few months. The principal alterations have been:—

Advanced.

East Caradon	£5½	New Rosewarne	£4
West Caradon	1	Prosper United	2
Gonamena	slightly	Nanjiles	2
Hingston Down	£1	Tincroft	1
Wheal Crebor	slightly	Stray Park	1
West Chiverton	£30	Wheal Seton	15
Chiverton	2½	West Seton	5
Chiverton Moor	1	West Tolgus	5
Great Wheal Vor	10	North Roskear	2½
St. Ives Consols	1	Bryntail	1
Wheal Basset	12½	Cape Copper	1½
South Basset	1		

Declined.

Trelawny	£3	East Basset	£5
Herodsfoot	3	South Tolgus	1
Great Wheal Fortune	5	Clifford Amalgamated	8½
Wheal Buller	6½	Cook's Kitchen	1½

West Chiverton shares have been considerably advanced in prices. On the 29th, they opened at 54*l.*-55*l.* ex. div., and have since steadily advanced to their closing quotation of 82½*l.*-85*l.* *Wheal Chiverton* shares have again improved to 14*l.*-14½*l.* *Chiverton Moor* shares have been dealt in at prices varying from 5*l.*-5½*l.* to 6½*l.*-6½*l.* *Wheal Trelawny* shares have receded from their opening quotation of 24*l.*-26*l.* to their closing one of 22*l.*-23*l.* *Herodsfoot* shares have also declined, being last quoted at 35*l.*-36*l.* *Wheal Ludcott and Wrey*, 2½*l.*-2½*l.* *East Chiverton*, 5*l.*-5½*l.* *Wheal Mary Ann*, 14*l.*-14½*l.* *Wheal Hope*, 5*l.*-5½*l.* *North Shepherds*, 3½*l.*-4*l.* *North Chiverton*, 2*l.*-2½*l.* *Cargoll*, 38*l.*-40*l.*

East Caradon shares have advanced considerably. They opened on the 28th at 27½*l.*-27½*l.*, and, after an almost daily fluctuation, were in demand on the 20th, at higher prices, being quoted at 30½*l.*-31*l.* On the 22nd, shares were quoted at 31*l.* (buyers), but before the end of the day they became lower at 29*l.*-29½*l.* On the 25th they rose to 31*l.*-31½*l.*, and again on the 26th to 33*l.*-33½*l.*, at which they close. *West Caradon* shares have improved from 20*l.*-22*l.* to 21*l.*-23*l.* *Gonamena* shares have also slightly advanced; their opening price was 2½*l.*-3½*l.*, and they have been quoted at 4½*l.*-4½*l.*, but close at 3½*l.*-4*l.*, at which prices they were enquired for. *South Caradon*, 430*l.*-440*l.* *Caradon Vale*, 3½*l.*-3½*l.* *Glasgow Caradon*, 3½*l.*-3½*l.* *South Caradon Wheal Hooper*, 10*s.*-12*s.* *Marke Valley*, 6½*l.*-¾*l.*

Wheal Basset shares have advanced during the month. They opened on the 29th at 70*l.*-75*l.*, being a decline from their previous prices, but were stronger on the 30th at 80*l.*-85*l.*, and on the 1st improved to 82½*l.*-87½*l.* On the 15th, shares were quoted higher at 85*l.*-90*l.*, and on the 16th were in demand at 87½*l.*-92½*l.* They finally improved on the 18th to their closing prices of 90*l.*-95*l.* There has been an improvement in *South Basset* shares, which were quoted on the 12th at 9½*l.*-10½*l.* *Wheal Buller* shares opened on the 29th at 38*l.*-40*l.*, and advanced until about the 8th, when they were 45*l.*-47*l.*; but since then they have almost daily declined, and close flat at 32½*l.*-33½*l.* There has been a decline in *East Basset* shares which opened at 67½*l.*-70*l.*, and close at 63*l.*-65*l.* *West Frances*, 25*l.*-27*l.* *North Basset*, 2*l.*-2½*l.* *North Buller*, 6*l.*-7*l.* *Wheal Grenville*, 5*l.*-5½*l.* *East Wheal Grenville*, 2½*l.*-2½*l.* *Copper Hill*, 11*l.*-13*l.* *South Grenville*, 5*s.*-6*s.*

Great Wheal Fortune shares have fluctuated considerably during the month. They opened at 18*l.*-20*l.* on the 28th, and had declined by the 18th to 15½*l.*-16½*l.* On the 10th shares sprung into request, and rose to 20*l.*-21*l.*, and on the 12th were firm at 21*l.*-22*l.* From this date they again declined, closing at 14½*l.*-14½*l.* *Great Wheal Vor* shares have improved

from their opening quotation of 15*l.*-15½*l.* to 24*l.*-25*l.*, with an upward tendency. *East Lovell* shares still continue to be dealt in, but show a slight falling off in prices; they opened at 9½*l.*-10½*l.*, and close at 8½*l.*-8¾*l.* *St. Ives Consols*, 30*l.*-32*l.*; *Providence*, 42½*l.*-43½*l.*; *Basset and Grylls*, 15*l.*-17*l.*; *Wheal Grylls*, 27*l.*-28*l.*; *Rosewall Hill and Ransom United*, 3*l.*-3½*l.*; *Calvadnick*, 6*l.*-6½*l.*; *Wendron Consols*, 6*l.*-6½*l.*; *Wheal Kitty* (Lelant), 12½*l.*-13½*l.*; *East Grylls*, 13½*l.*-14*l.*; *Wheal Margaret*, 17*l.*-18*l.*; *Great Wheal Grylls*, 4½*l.*-5*l.*

Wheal Seton shares have again improved in price. They opened on the 20th at 160*l.*-165*l.*, and after much fluctuation reached 180*l.*-185*l.*, that being the highest price they attained during the month; they close at 177½*l.*-180*l.* *West Seton* shares have also risen to their closing price, 190*l.*-200*l.* *West Tolgus* shares have likewise improved. They were last quoted in November at 52½*l.*-57½*l.*, and now stand at 57½*l.*-62½*l.*; *North Roskear*, 24½*l.*-25½*l.*; *North Crofty*, 5*l.*-5½*l.*

New Rosewarne shares have shown more briskness during the last few weeks, and have improved upon our last quotation. They opened on the 29th at 8½*l.*-9½*l.*, and steadily advanced until the 19th to 12*l.*-14*l.*, at which they remained until the 23rd, when they were quoted at their closing prices of 12½*l.*-13*l.* *Prosper United* shares have been in demand at higher prices. They opened at 5½*l.*-6*l.*, and advanced up to the 10th to their highest price of 7½*l.*-8½*l.*, closing slightly lower at 7*l.*-7½*l.* *Wheal Unity*, 5*s.*-10*s.*; *Wheal Kitty* (St. Agnes), 7½*l.*-7¾*l.*; *East Rosewarne*, 2½*l.*-2¾*l.*; *Pendeen Consols*, 6½*l.*-6¾*l.*; *Great Retallack*, 6*s.* 6*d.*-7*s.* 6*d.*; *Tre'oweth*, 34*s.*-36*s.*

Nanyiles shares have advanced in price. They opened on the 29th at our last quotation of 32½*l.*-33½*l.*, and advanced steadily up to 36*l.*-38*l.*, but afterwards relapsed to their closing quotation of 34½*l.*-35½*l.* *Clifford Amalgamated* shares have been flat, and have declined from 31½*l.*-38½*l.* to 35½*l.*-36½*l.*; *St. Day United*, 35*s.*-36*s.*; *Gambler and St. Aubyn*, 10*l.*-11*l.*; *Great Wheal Busy*, 4½*l.*-4¾*l.*; *East Gambler*, 2½*l.*-2¾*l.*; *West Damsel*, 90*l.*-95*l.*

There has been a fair amount of business transacted in *Tincroft* shares, which have slightly improved. They opened on the 29th at 19½*l.*-20½*l.*, and were quoted on the 6th at 20*l.*-22*l.*, but close lower, at 20*l.*-21*l.* In *Stray Park* shares also there has been some improvement, being last quoted at 28½*l.*-29½*l.*; *Cook's Kitchen* shares have been quoted lower, at 19½*l.*-20½*l.* *Camborne Vean*, 2½*l.*-2¾*l.*; *Wheal Harriett*, 1¾*l.*-2*l.*

Hingson Down shares have been considerably dealt in at slightly better prices. They opened on the 29th at 4*l.*-4½*l.*, being an advance of 15*s.* upon our last quotations, and went up at one time to 5*l.*-5½*l.*, but close lower at 4*l.*-4½*l.* There has also been an improvement in *Wheal Crebor* shares, which opened at 33*s.*-35*s.*, and leave off at 2½*l.*-2¾*l.* *East Russell* shares have been flat at 4½*l.*-5*l.* *Drakewalls*, 38*s.*-40*s.* *Lady Bertha*, 16*s.*-18*s.* *New Martha*, 1*l.*-1½*l.*

South Tolgus shares have not fully sustained the improvement made in them last month. They opened on the 29th at 42*l.*-43*l.*, and were quoted on the 6th at 42½*l.*-45*l.*, but fell again on the 11th to 41*l.*-43*l.*, at which they *Great South Tolgus*, 4*l.*-4½*l.* *North Downs*, 1½*l.*-2*l.* *North Treskerby*, 2½*l.*-3*l.* close. *East Carn Brea*, 7*l.*-7½*l.* *Wheal Union*, 2½*l.*-3*l.* *Wheal Ury*, 6½*l.*-7*l.*

In Welsh mines prices have been quoted as follows:—*Bryntail*, 2½*l.*-3*l.* *Bryn Gwiog*, 35*l.*-36*l.* *Central Minera*, 2*l.*-2½*l.* *Prince of Wales*, 5*s.*-6*s.* *Bedol-Aur*, 10*s.*-12*s.*

Among foreign and colonial mines, transactions have been reported in *Cape Copper* shares at 8½*l.*-8¾*l.* *Cobre Copper* shares have also been dealt in at 34½*l.*-34¾*l.* *Fortuna*, 4½*l.* *Unica Mexican*, 6½*l.* *Otea Copper*, 2½*l.*-2¾*l.* prem. *Panulcillo*, 1¾*l.*-1¾*l.* prem. *Norwegian Copper*, 5*s.*-10*s.* prem. *Worthing*, 17*s.* 6*d.*-20*s.* *Yudanamutan*, at 2½*l.*-3*l.* *El Chico*, 15*s.*-25*s.* prem. *Don Pedro North Del Rey*, 1*£.* ex. n. *Santa Barbara*, 17*s.* 6*d.* *St. John Del Rey*, 51½*l.* *Port Phillip*, 1½*l.* *Copiapó*, 5*l.* *English and Australian Copper*, 2*l.*-2½*l.*-2*l.* *East del Rey*, 15*s.*-17*s.* 6*d.* *Kapunda*, 1¾*l.* *Pontgibaud*, 7*l.*

Montes Aureos, 2½-2¾l. *Scottish Australian*, 15s.-17s. 6d. *Alamillos*, 10s.-15s. *Vancouver Coal*, 5½l. *Anglo-Mexican Mint*, 18l.-18½l.-18¾l. *Linares*, 6¾l. x. d. *Capula*, 12s. 6d. *Quebrada Land and Mining*, 3¾l.

Among new undertakings, *South Wales Colliery* shares have been quoted at 2l.-2½l. prem. *Central Grylls*, 3½l.-3¾l. (2l. 10s. paid). *Chiverton Valley*, 5½l.-5¾l. *Grylls's Wheel Florence*, 3¾l.-3¾l. *West Clifford* shares are reported to have been done at 1½l.

CORNWALL.—There has been a great amount of activity in the Cornish share market, and prices generally have been well maintained. *Nanjles* shares have been in demand at 35l.-35½l. *Great Wheel Busy* shares dealt in at 4½l.-4¾l. *East Caradon* shares have been well maintained at 28l.-29l. *North Crofty* shares have been inquired for at 5½l. *St. Day United*, 35s. *Great North Downs*, 2l.-2½l. *Wheel Seton*, 180l.-185l.

BIRMINGHAM.—*Muntz's Metal* shares were last quoted at 2s. 6d. dis.-2s. 6d. prem. *Cannock Chase Colliery*, 3½l. prem.

LEEDS.—*Craven Moor* shares have again been reported at 2s. 6d.

LIVERPOOL.—*Santa Barbara*, 1s. prem. *Copiapu and Caldera*, 145l.

MANCHESTER.—*Gartgell Gold*, par.

NEWCASTLE-ON-TYNE.—The mining market has been pretty active, the principal mines dealt in being *Wheel Seton*, *West Chiverton*, and *Wheel Chiverton*.

DUBLIN.—The Irish mining share market has been characterised by a considerable amount of briskness, although prices have scarcely been maintained. *Mining Company of Ireland* have advanced to 23½l. *General Mining Company for Ireland* shares, 4l. *Connorree*, 19s. 6d.-20s. *Carysfort*, 16s.-19s.

NEW YORK, February 8th.—In the market for mining shares the following have been the principal fluctuations—**ADVANCED:** *Cumberland Coal*, \$2; *Caledonia*, \$1; *Central*, \$2. **DECLINED:** *American Coal*, \$8; *Erie Lead*, \$1; *Hancock*, \$1; *Quincy*, \$9. The following are the closing quotations: *American Coal*, \$85-\$87; *Aztec*, \$4½-\$4¾; *Bucks Co.*, \$1½-\$1¾; *Bohemian*, \$10 (buyers); *Caledonia*, \$7-\$9; *Canada*, \$2-\$3; *Copake Iron*, \$13-\$15; *Cumberland Coal*, \$51-\$52; *Carp Lake*, \$3½-\$4½; *Cascade*, \$½-\$¾; *Central*, \$57-\$59; *Columbian*, \$7½-\$8½; *Erie Lead*, \$15-\$21; *Evergreen Bluff*, \$9½-\$10; *Everett*, \$2-\$4; *Eureka*, \$1½-\$2; *Flint Steel River*, \$9-\$10; *Franklin*, \$50 (sellers); *Hilton*, \$3½-\$4½; *Hancock*, \$13 (sellers); *Hamilton*, \$3-\$5; *Huron*, \$40 (buyers); *Indiana* (asst. paid), \$5½-\$6½; *Ile Royat*, \$24½-\$25½; *Knowlton*, \$8-\$9½; *Lafayette*, \$1½-\$2; *Lancaster Lead*, \$3½-\$4½; *Mariposa*, \$33-\$36; *Manhattan* (asst. paid), \$5½-\$7; *Mandan*, \$5½ (sellers); *Minnesota*, \$70-\$72; *Montana Gold*, \$½-\$1; *National*, 29½-31½; *New York*, \$1-\$2; *N. J. Consolidated*, \$3 (buyers); *New Jersey Zinc*, \$76-\$85; *Norwich*, \$5½-\$5¾; *New York and Nova Scotia Gold*, \$2½-\$3½; *Ontonagon*, \$2½-\$3; *Ogima*, \$5½-\$5¾; *Pennsylvania Coal*, \$180; *Pewabic*, \$58-\$61; *Providence*, \$2½-\$2¾; *Placencia Bay*, \$1½-\$2; *Quartz Hill Gold*, \$13½-\$15; *Quicksilver Mining Co.*, \$49; *Quincy*, \$87-\$89; *Rockland* (asst. paid), \$15 (buyers); *Superior*, \$8½-\$10; *Susquehanna Coal*, \$88; *Teal Lake Iron*, \$5 (buyers). [*** American Gold*, \$159½.]

SAN FRANCISCO, January 9th.—More than the usual amount of business has been transacted in this market during the past months. The shares chiefly dealt in have been *Burning Moscow*, *Gould and Curry*, *Ophir*, and *Lady Bryan*.

Burning Moscow still attracts most attention. Shares at one time advanced to \$190, but have since declined and close at \$137½ to \$140. *Gould and Curry* have continue to advance, \$5,000 has been offered,

while holders have scarcely been willing to sell at \$5,025. *Ophir* shares have declined from our last quotation of \$1,660 to \$1,490. *Lady Bryan* shares have excited much attention, and in consequence of favourable accounts from the mine have rapidly and largely advanced, at one time reaching \$50, but close at \$38. *Yellow Jacket* shares have been dealt in at \$950. *Hale and Norcross* shares have been enquired for at \$1,000, but have been held firmly at \$1,100. *Baltic* shares have been steady at \$100. *Melones* shares have declined from \$110 to \$75. *Savage* shares have slightly declined, being last quoted at \$2,700. *Wide West* shares have been enquired for at \$47 to \$51. Some business has been transacted in *Utah* shares at \$21 to \$30.

METAL MARKETS.

LONDON, February 26th.—During the past month the metal market has shown an entire want of that activity which has before characterised it for some time past. Business generally has been much restricted; and quotations have had a downward tendency.

IRON.—Considering the general state of the metal the iron has been fairly active.

Scotch pig-iron has had a downward tendency all through the month. Prices opened at 63s. 3d. cash, 65s. 10½d. three months. By the 8th they had declined to 61s. 6d., and under the influence of pressing sales close at 60s. 3d. cash, 62s. 3d. three months.

Welsh bars have remained steady at 8l. f.o.b. in Wales. The better qualities of Staffordshire descriptions have been in fair demand, with little variation in prices. Swedish continues to look, and the stock being comparatively small there is no prospect of prices declining.

COPPER.—Very little business has been done in this metal, but the market closes slightly firmer than at the beginning of the month. Second-hand parcels have been obtainable at 3l. below smelters' prices. Hardly any business has been reported in foreign, and prices have been quite nominal.

TIN.—The market for this metal has been very dull, English being obtainable under fixed prices. Straits, 117l. Banca, 118l.

TIN PLATES have been very firm and scarce.

LEAD has been very firm. Good soft English, 21l. 10s. to 21l. 15s. W.B., 22l. 5s.

SPELTER.—Towards the close of the month a large business was done in this article, about 1,600 tons having changed hands at prices varying from 21l. 5s. to 21l. 17s. 6d.

GLASGOW, February 25th. **IRON.**—Dullness has been the prevailing characteristic of the pig-iron market during the past month, and there has been a considerable decline in prices. The market opened firm at 63s. 3d. cash, and remained pretty steady, with little business doing, between that price and 62s. 3d. until the 9th, when the market was very flat at 60s. 3d. cash. On the 11th prices improved to 61s. 6d., and remained firm at that rate until the 17th, when they again fell to 60s. 3d. By the 22nd they had again declined to 59s., at which a good business is reported. The market closes firm at 59s. 4½d. to 59s. 6d. cash. No. 1 G.M.B., 58s. 9d.; No. 2, 57s. 9d.

PARIS, February 25th. **COPPER.**—Business in this metal has been very limited. English, 262½ fr. Lake Superior, 300 fr.

LEAD has been in little request at unaltered prices.

COLOGNE, February 22nd.—The market has been very firm, and there has been a large demand for lead, zinc, and spiegeleisen, for export. Prices show no change.

AMSTERDAM, February 21st.—**TIN** has been in little demand; Banca, 70 fl. **COPPER** has been flat, with few purchasers. **LEAD** has been firm.

BRESLAU, February 20th. SPELTER.—The market for this article has been very firm at higher prices.

HAMBURG, February 18th. IRON.—Scotch pig, 2½ mk. Staffordshire descriptions, 7½ mk. to 7¾ mk.

COPPER.—There has been little demand for this article, and prices have been merely nominal. English, 70 to 72 mk.

TIN has been little inquired for. Banca, 13 to 13½ sch.

BERLIN, February 20th.—The amount of business transacted in the metal market during the past month has been very limited, without any apparent prospect of improvement.

IRON.—Scotch pig, 52½ to 54 sgr. Staffordshire descriptions, 4½ thlr.

In **COPPER** a very trifling business has been done at nominal rates.

TIN has been little dealt in. Banca, 42 thlr.

LEAD has been exceedingly quiet at 6¾ to 7½ thlr.

HONGKONG, January 15th. LEAD.—Sales, 900 pigs; common, \$6.30 to \$6.40; best, \$6.70 to \$6.80.

IRON.—Nail rod, \$2.40 to \$2.70; sales, 3,200 piculs. Hoop, \$3.20 to \$3.40; sales, 420 piculs. Bar, \$2.50 to \$2.60; Swedish, \$4 to \$4.40; sales, 1,050 piculs.

THE BOARD OF TRADE RETURNS.

The "Accounts relating to Trade and Navigation of the United Kingdom, for the month ended 31st December, 1863, and twelve months ended 31st December, 1863," have been issued by the Statistical Department, Board of Trade.

IMPORTS.—The quantities and relative increase and decrease of the imports of metals, metallic ores, and mineral products, for the month and twelve months ended 31st December, have been as follows:—

	Month ended 31st December.			Twelve Months ended 31st December.		
	1862.	1863.	Increase (+) or Decrease (—)	1862.	1863.	Increase (+) or Decrease (—).
Brimstone cwt.	81,593	59,736	— 21,857	1,067,387	847,732	— 219,655
Copper Ore tons	9,536	9,635	+ 99	83,050	80,693	— 1,357
Copper Regulus "	5,567	2,188	— 3,379	35,388	21,406	— 13,982
Copper, unwrought and part wrought cwt.	24,826	31,260	+ 6,334	268,020	243,240	— 14,780
Iron, in Bars, unwrought, tons	10,510	4,410	— 6,100	49,662	46,635	— 3,027
Steel, unwrought "	1,254	1,129	— 125	5,050	4,016	— 1,034
Lead, Pig and Sheet "	3,756	5,066	+ 1,310	23,693	28,640	+ 4,947
Spelter or Zinc "	6,079	6,837	+ 758	23,709	34,572	+ 10,863
Tin, in Blocks, Ingots, } Bars, or Slabs cwt.	20,311	12,154	— 8,157	87,873	54,559	— 33,314
Silver Ore... .. value in £	57,918	23,570	— 34,348	331,564	272,826	— 58,638
Petroleum tons	7,625	4,446	— 3,179	22,160	35,345	+ 13,185
Quicksilver lbs.	104,278	606,660	+ 506,382	1,161,352	1,762,393	+ 601,041

EXPORTS.—The quantities, declared value, and relative increase and decrease of the exports of metals, minerals, and metallurgical articles of British and Irish produce and manufactures, for the month and twelve months ended 31st December, have been as follows:—

LONDON PRICES CURRENT OF METALS.

From Messrs. JAMES and SHAKSPERE'S, 10, Austin Friars, E.C., 26th Feb.

		Per Ton.	
IRON	Rails	in Wales ..	£8 0 0 @ £8 5 0
Welch	Bars	" ..	8 5 0 " 8 10 0
	"	" ..	9 0 0
	"	" ..	10 10 0
Staffordshire ..	Nail Rods	" ..	10 2 6 " 10 10 0
	Hoops	" ..	11 0 0 " 11 10 0
	Sheets	" ..	12 0 0 " 12 10 0
Scotch	Pig (mixed Nos. warrants) in the Clyde	" ..	3 0 0 " 3 0 6
Swedish	Iron { Large sizes ..	" ..	12 10 0 " 12 15 0
	{ Indian assortments ..	" ..	12 10 0 " 13 0 0
Hammered ..	Steel { Faggot	" ..	17 0 0 " 17 10 0
	{ In kegs ($\frac{1}{4}$ and $\frac{1}{2}$ in.) ..	" ..	16 0 0
		Per Unit.	
COPPER	Ore	19s. 6d. @	20s.
	Regulus	19s. 9d. "	20s. 3d.
	Barilla	20s. 6d. "	21s.
		Per Ton.	
	Chili Slab (for 96% pure Copper)	—	none —
	Spanish Cake	—	@ £100 0 0
Australian ..	Burra and P.C.C.	—	" 114 0 0
	Kapunda	114 0 0	" 115 0 0
	Wallaroo	—	" 114 0 0
American....	Baltimore	—	none —
	Lake Superior	—	—
	Tough Cake and Ingot and Tile ..	—	@ 113 0 0
English	Best selected Ingot	—	" 116 0 0
	Sheets, Sheathing and Rod	—	" 120 0 0
	Flat Bottoms	—	" 125 0 0
		Per lb.	
YELLOW METAL..	Sheets	9 $\frac{1}{2}$ d. @	10d.
	Sheathing and Rod	10d. "	10 $\frac{1}{2}$ d.
		Per Cwt.	
TIN	Common Blocks and Ingots	115s. @	116s.
English ..	" Bars (in barrels)	116s. "	117s.
	Refined	—	" 121s.
	Straits, Fine	—	" 117s.
Foreign ..	" (with 3 months' prompt) ..	118s. 6d. "	119s.
	Banca	118s. "	119s.
		Per Box.	
TIN PLATES	Charcoal IC, best	31s. 0d. @	31s. 6d.
	" IX "	37s. 0d. "	37s. 6d.
	Coke IC	26s. 0d. "	27s. 0d.
	" IX	32s. 0d. "	33s. 0d.
		Per Ton.	
LEAD.....	Sheet	£21 17 6 @	£22 0 0
English ..	Pig—W.B.	22 5 0 "	22 7 6
	" Other good brands	21 12 6 "	21 15 0
Foreign ..	German and Spanish, soft ..	20 17 6 "	21 0 0
	Red	—	" 22 0 0
English ..	Shot	—	" 24 0 0
	Dry White	—	" 26 0 0
SPELTER	(Silesian) in Cakes	23 0 0 "	23 10 0
ZINC	(Sheet) No. 9 and upwards	26 10 0 "	27 0 0
		Per Bottle.	
QUICKSILVER (in bottles containing 75lbs. each)		— @	8 0 0
		Per Ton.	
REGULUS OF ANTIMONY, French Star		— @	38 0 0

Tabular Abstract of Mining Accounts for the Month.

Date of Account.	Name of Mine, and Number of Shares.	Balances.		Calls.		Dividends.	
		Debit.	Credit.	Per Share.	Total.	Per Share.	Total.
		£ s. d.	£ s. d.	£ s. d.	£ s. d.	£ s. d.	£ s. d.
CORNISH & DEVON MINES							
Jan. 19	North Rosewarne (5,144).....	346 3 8	—	0 5 0	1,536 0 0	—	—
" 20	West Maria and Fortescue (12,000)	1,684 3 9	—	—	—	—	—
" 20	East Margaret (1,024)	1,105 15 9	—	0 15 0	768 0 0	—	—
" 25	West Chiverton (3,000)	—	5,302 4 2	—	—	0 15 0	2,250 0 0
" 25	Chiverton (3,000)	—	1,547 5 1	—	—	—	—
" 25	Penhallow Moor (512)	—	—	1 0 0	512 0 0	—	—
" 26	South Caradon (512)	—	5,287 1 10	—	—	6 0 0	3,072 0 0
" 26	East Lovell (1,906)	—	947 1 6	—	—	0 7 6	714 15 0
" 26	East Basset (512)	—	1,627 15 11	—	—	2 0 0	1,024 0 0
" 26	South Tolgus (512)	505 0 0	—	—	—	—	—
" 26	Trewozia (2,048)	—	—	0 5 0	512 0 0	—	—
" 26	Wheal Trannack (960)	49 1 8	—	0 2 6	120 0 0	—	—
" 27	West Basset (6,000)	—	1,779 17 3	—	—	0 5 0	1,500 0 0
" 27	Wheal Harriett (5,120)	—	1,730 8 5	—	—	—	—
" 28	North Phoenix (4,000)	—	317 0 0	0 2 6	500 0 0	—	—
" 28	Lady Bertha (6,000)	—	313 17 5	0 3 0	900 0 0	—	—
" 28	New Seton (400)	310 4 9	—	2 0 0	800 0 0	—	—
" 28	Craddock Moor (1,055)	—	971 12 6	—	—	—	—
" 28	Gonamenia (6,144)	—	322 6 0	0 2 0	614 8 0	—	—
" 28	North Pool (6,400)	826 6 9	—	0 10 0	3,200 0 0	—	—
" 29	North Downs (6,000)	840 0 2	—	0 2 6	750 0 0	—	—
" 29	Wheal Crofty (6,000)	446 6 4	—	0 5 0	1,500 0 0	—	—
" 30	Roskear (6,000)	—	2,913 19 3	—	—	—	—
" 30	South Gorland (2,000)	380 0 2	—	0 10 0	1,000 0 0	—	—
Feb. 1	East Rosewarne (5,000)	—	420 6 3	—	—	—	—
" 1	Polbigey Moor (6,000)	841 12 6	—	0 5 0	1,800 0 0	—	—
" 2	Wheal Basset (512)	—	2,205 13 9	—	—	1 10 0	761 0
" 2	Bottle Hill (6,000)	—	—	0 2 0	500 0 0	—	—
" 2	South Basset (512)	600 4 10	—	—	—	—	—
" 2	Herodasfoot (1,024)	—	2,884 17 0	—	—	1 15 0	1,792 0 0
" 3	East Fortune (2,000)	—	1,041 1 11	—	—	—	—
" 3	Ludcott and Wrey (4,800)	215 17 5	—	0 5 0	1,200 0 0	—	—
" 4	West Jane (9,017)	1,545 0 0	—	0 3 6	1,577 19 6	—	—
" 4	North Jane (2,000)	823 10 6	—	0 7 6	750 0 0	—	—
" 8	Wheal Seton (396)	—	2,198 16 8	—	—	4 0 0	1,584 0 0
" 8	Frank Mills (5,000)	—	1,984 3 6	—	—	0 3 0	750 0 0
" 8	Dolecloth (358)	—	3,585 0 0	—	—	8 0 0	2,864 0 0
" 9	East Grenville (6,000)	1,148 0 0	—	0 4 0	1,200 0 0	—	—
" 9	North Treskerby (5,936)	—	986 3 8	—	—	0 2 6	742 0 0
" 10	Calvadnack (215)	—	16 14 11	—	—	—	—
" 10	Camborne Consols (1,000)	137 1 6	—	0 10 0	500 0 0	—	—
" 10	New Trevenen (960)	—	—	1 0 0	960 0 0	—	—
" 10	East Grambler ()	—	—	0 4 0	?	—	—
" 10	West Frances (512)	859 5 5	—	2 0 0	1,024 0 0	—	—
" 11	Hawkmoor (7,219)	176 3 0	—	0 2 6	902 7 6	—	—
" 11	Wheal Prosper (970)	1,399 2 6	—	1 8 10	1,898 3 4	—	—
" 11	Wheal Norris (6,000)	1,319 4 10	—	0 4 0	1,200 0 0	—	—
" 16	St. Ives Consols (940)	—	—	—	—	1 0 0	940 0 0
" 16	West Seton (400)	—	2,466 10 0	—	—	4 0 0	1,600 0 0
" 16	South Wheal Leisure (6,000)	—	—	0 5 0	1,500 0 0	—	—
" 16	Wheal Polmear (1,024)	—	300 16 2	—	—	—	—
" 17	Clifford Amalgamated (2,906)	—	1,564 3 0	—	—	0 10 0	1,450 0 0
" 18	Wheal Trelawny (1,040)	—	878 1 9	—	—	0 15 0	780 0 0
" 18	Wheal Crebor (6,000)	—	292 10 6	0 1 6	450 0 0	—	—
" 18	Wheal Unity (6,000)	—	—	0 3 0	900 0 0	—	—
WELSH MINES.							
Jan. 26	Bryn Gwio (500)	—	95 7 3	—	—	—	—
" 27	Bronfford (5,000)	—	1,231 17 6	—	—	0 2 6	625 0 0
" 29	Wentnor (4,000)	—	121 9 2	—	—	—	—
Feb. 5	Penralt (6,000)	—	—	0 2 0	600 0 0	—	—
" 9	Dolfrwynog (20,000)	—	—	0 2 6	2,500 0 0	—	—
" 17	Nanteos (4,000)	—	1,307 15 0	—	—	—	—
FOREIGN MINES.							
Jan. 26	Cobre (12,000)	—	—	—	—	1 0 0	12,000 0 0
" 27	Capula (25,000)	—	6,425 10 4	—	—	—	—
Feb. 18	English & Australian (70,000)	—	10,572 8 0	—	—	0 2 6	8,750 0 0

Copper Ores.

Sampled Jan. 13, and sold at Tabb's Hotel, Redruth, Jan. 28.

Mines.	Tons.	Purchasers.	Price.	Mines.	Tons.	Purchasers.	Price.
Clifford Amalgamated	94	4, 6	£5 8 6	West Caradon	56	5	£10 8 0
	72	8	3 10 6		48	2, 3	6 17 0
	69	10	0 14 0		28	2	5 12 0
	59	3	4 1 6		22	5	1 13 6
	48	3	3 4 0	North Trekerby	66	7	5 16 0
	44	3, 12	1 14 6		65	7	6 18 0
	43	5	1 18 6		56	7	6 10 0
	37	2	4 11 6		55	3	4 10 0
	34	12	1 12 6		49	7	7 12 0
	25	12	0 13 6		47	3	6 3 6
	22	3	4 16 0	Fowey Consols	69	1	7 3 6
	20	2	9 1 6		68	1, 6	6 18 6
	16	5	5 17 6		63	1	7 0 0
Great Wheal Busy ...	92	6	4 12 0		60	1	6 11 6
	85	3	4 15 6	Wheal Rose	80	3	6 17 0
	82	6	3 5 0		70	2	5 6 0
	65	7	3 8 6		62	7	6 12 6
	58	7	1 19 6		51	11	6 13 0
	45	12	3 14 6	Craddock Moor	64	13	7 5 0
	19	11	7 15 0		51	13	7 10 6
	2	8	37 7 6		80	4, 6	7 2 6
(Old Hallenbeagle)	38	3	6 15 0	Wheal Polmear	52	12	5 11 0
Phoenix Mines	104	5	3 3 0		45	1	13 0 6
	89	8	3 13 6		33	6	6 3 6
	70	7	5 14 0	North Downs	46	13	7 12 0
	65	7	5 6 0		44	13	6 12 6
	54	5	4 4 6		39	13	8 3 0
	52	10	1 13 6	Glasgow Caradon	52	9	4 10 6
	30	5	3 1 6		48	8, 12	4 13 6
South Caradon	99	2	6 13 0	Boscawen	49	2	4 19 0
	92	9	7 3 6		29	6	9 10 0
	61	1	22 19 6	St. Day United	35	8	4 11 0
	59	6	10 11 6		11	3	18 12 6
	58	2, 6	8 15 6	South Crinnis	22	10	5 11 6
	52	1, 6	21 18 6	Wheal Prudence	16	1	4 5 0
	35	9	7 5 6	Treffry's Regulus	15	8	14 5 6
West Caradon	76	13	8 18 0	Phillips's Ore	6	5	3 7 0
	62	6, 11	6 11 0	West Far Consols ...	2	7	24 0 0
	58	6	9 11 0				

TOTAL PRODUCE AND VALUE.

	Tons.	Amount.		Tons.	Amount.
Clifford Amalgamated ...	582	£1,981 7 6	North Downs	129	£959 19 6
Great Wheal Busy	486	2,078 17 6	Glasgow Caradon	100	458 8 6
Phoenix Mines	464	1,801 13 6	Boscawen	78	520 0 0
South Caradon	456	5,247 10 6	St. Day United	46	263 17 0
West Caradon	345	2,713 5 6	South Crinnis	22	122 13 0
North Trekerby	338	2,102 12 0	Wheal Prudence	16	68 8 0
Fowey Consols	260	1,801 11 0	Treffry's Regulus	15	213 15 0
Wheal Rose	253	1,604 12 6	Phillips's Ore	6	20 5 0
Craddock Moor	145	1,060 5 0	West Far Consols	2	48 0 0
Wheal Polmear	130	1,078 13 6			

EACH COMPANY'S PURCHASE.

	Tons.	Amount.		Tons.	Amount.
1 Vivian and Sons	374	£4,191 0 6	9 Copper Miners' Co.	179	£1,148 14 6
2 Freeman and Co.	361	2,172 3 0	10 Charles Lambert	143	258 1 0
3 Grenfell and Sons	467	2,491 2 0	11 Newton, Keates & Co.	101	690 14 6
4 Crown Copper Co.*	—	—	12 Sweetland, Tuttle & Co.	202	679 16 0
5 Sims, Williams & Co.	330	1,467 2 0	13 Pendawdd Copper Co.	320	2,482 17 6
6 Williams, Foster & Co.	597	4,334 5 0			
7 Mason and Elkington ...	548	3,034 13 6	Total	3,873	£24,245 14 0
8 Bankart and Sons	261	1,306 4 6			

Average Produce, 6½.

Quantity of Fine Copper, 254 tons 13 cwts.

Average Standard

Average Price per ton

* The purchases made by No. 4 (Crown Copper Co.) are included in the total of No. 6 (Williams, Foster & Co.), those firms being identical.

Copper Ores.

Sampled Jan. 11, and sold at Table's Head, Redruth, Feb. 4.

Miner	Tons.	Pur- chasers.	Price.	Miner	Tons.	Pur- chasers.	Price.
Clifford Amalgamated	284	1, 1	£13 4 6	East Pool	28	7	£4 9 0
89	1	4 14 4		Wheal Basset	71	13	5 8 6
34	4	5 14 4		70	9	5 15 6	
16	11	11 11 4		39	13	11 11 0	
15	1	5 5 4		South Crofty	63	3	2 5 0
79	1	4 4 4		43	10	1 6 0	
54	1	7 11 4		34	6, 11	6 4 6	
54	3	3 5 4		Wheal Grenville	50	1, 5	10 10 6
49	1	4 15 6		43	1	7 7 6	
25	3	4 4 6		32	7	5 11 0	
22	3, 5	4 1 6		South Tolgus	81	7	5 2 0
'Cannock', 45	1	13 2 6		41	3	9 12 0	
11	5	3 2 0		Dolcoath	39	2, 6	7 16 0
Wheal Seton	54	3	5 0 0	38	12	3 2 6	
(Pendarves), 134	10	1 7 6		37	6	6 6 0	
93	5	5 12 0		South Frances	48	1	6 10 6
71	3	1 6 0		46	1, 7, 13	5 10 6	
55	7, 11	7 3 0		20	6	6 8 0	
51	11	6 0 0		East Wheal Basset	43	1	8 2 6
29	3	16 2 0		41	1	7 16 6	
West Seton	65	6, 8	5 1 6	28	1	7 0 6	
63	8	4 16 6		Tincroft	50	7	2 17 6
62	6	7 2 6		36	11	7 1 0	
60	9	8 11 0		West Tolgus	68	4, 6	7 5 6
57	9, 11	6 9 0		Condurrow	38	6	4 17 6
52	4, 6	8 11 6		16	2	6 5 0	
47	7	5 10 0		Wheal Vyvyan	22	1	3 15 6
39	4, 6	3 1 6		15	5	6 8 0	
East Pool	83	7	5 5 0	Stray Park	25	8	3 10 6
71	8	3 3 6		10	7	1 1 0	
70	5	0 7 6		Mayne & Chapple's Ore	33	4, 6	0 5 6
54	6, 8, 13	5 9 0		East Grenville	22	1	3 6 6
34	5, 10	2 18 6		10	1	2 0 0	
32	5	2 0 0		Camborne Vean	25	6, 7	3 14 6

TOTAL PRODUCE AND VALUE.

	Tons.	Amount.		Tons.	Amount.
Clifford Amalgamated	800	£6,134 6 6	East Basset	112	£866 18 0
Wheal Seton	493	2,722 4 0	Tincroft	86	397 11 0
West Seton	445	2,975 11 6	West Tolgus	68	494 14 0
East Pool	372	1,272 19 6	Condurrow	49	260 17 6
Wheal Basset	180	1,239 17 6	Wheal Vyvyan	37	179 1 0
South Crofty	140	409 6 0	Stray Park	35	98 12 6
Wheal Grenville	125	1,020 19 6	Mayne & Chapple's Ore	33	9 1 6
South Tolgus	122	806 14 0	East Grenville	32	93 3 0
Dolcoath	114	656 1 0	Camborne Vean	25	93 2 6
South Frances	114	695 7 0			

EACH COMPANY'S PURCHASE.

	Tons.	Amount.		Tons.	Amount.
1 Vivian and Sons	392½	£3,278 2 10	9 Copper Miners' Co.	158½	£1,101 1 6
2 Freeman and Co.	212½	1,215 6 6	10 Charles Lambert	194	289 17 6
3 Grenfell and Sons	396	2,659 3 6	11 Newton, Keates & Co. ...	160	1,046 1 6
4 Crown Copper Co.*			12 Sweetland, Tuttle & Co. ..	38	118 15 0
5 Sims, Williams & Co.	358	2,338 13 6	13 Fencalwdd Copper Co.	143½	1,018 8 10
6 Williams, Foster & Co.	504½	3,431 8 6			
7 Mason and Elkington	521½	2,513 4 1	Total	3,882	£20,426 7 6
8 Bankart and Sons	303½	1,516 4 3			

Average Produce, 6½.
Quantity of Fine Copper, 218 tons 6 cwt.

Average Standard£136 3 0
Average Price per ton 6 1 0

* The purchases made by No. 4 (Crown Copper Co.) are included in the total of No. 6 (Williams, Foster & Co.), those firms being identical.

Copper Ores.

Sampled Jan. 27, and sold at Tabb's Hotel, Redruth, Feb. 11.

Mines.	Tons.	Pur- chasers.	Price.	Mines.	Tons.	Pur- chasers.	Price.
West Basset	78	1	£5 6 6	Copper Hill	39	12	£2 3 6
	71	3	4 3 0		35	6	2 10 0
	68	1, 2	8 17 6		34	1, 3	8 12 6
	59	8, 10	4 5 6	Par Consols	68	9	6 18 6
	58	1	6 6 6		34	3	4 6 6
	52	3	3 12 6	Rosewarne Consols ...	40	13	7 6 0
	38	1	5 0 0		31	1	8 14 6
Prosper United.....	90	1	4 2 6		21	2	5 11 0
	85	7	6 7 0	Wheal Anna	91	7	5 17 6
	80	1	2 17 6	Great South Tolgus...	51	3	9 9 6
	49	5	5 15 6		36	2, 4, 6	7 18 6
Carn Brea	55	2	9 15 6	Rosewarne United ...	41	6	9 10 6
	54	3, 6, 7	5 12 6		33	8	3 7 6
	53	10	3 1 0	Botallack	41	1	7 7 6
	46	6	4 4 6		31	8	5 6 6
	38	7	4 15 0	Wheal Buller	69	7	3 9 6
	36	3	8 0 0	New Rosewarne	50	1, 6	10 9 0
	4	5	14 2 6		16	1, 6	22 16 6
Levant	87	5	7 4 0	Charlotte United	47	6	7 18 0
	59	4, 6	4 14 6		14	6	1 12 0
	41	1	1 6 6	West Fowey Consols	40	7	10 19 6
	40	5	5 8 0	Higgins's Ore	32	5	1 7 6
	2	5	14 2 6	Treworlis	23	1	4 12 6
East Carn Brea	62	4, 6	4 8 0	Alfred Consols	22	2, 7	7 6 6
	60	3, 7	5 3 6	Boiling Well	18	5	2 8 6
	24	3	4 8 6	Great Wheal Alfred...	11	6	4 3 0
	18	7	8 18 6	Boscawell	11	8	5 14 6
Treloweth	82	4, 6	4 6 0	South Dolcoath	11	6	12 1 0
	23	7	14 19 0	Great Wheal Fortune	8	1	8 2 6
	20	4, 5, 6	6 13 0	Wheal Unity Consols	7	8	7 14 0
Pendeen Consols	60	1	8 10 6	Camborne Consols ...	4	6	9 12 0
	50	4, 6	2 17 6	Borlase's Ore.....	3	5	3 11 6

TOTAL PRODUCE AND VALUE.

Tons.	Amount.	Tons.	Amount.
West Basset	424	£2,311	1 6
Prosper United	304	1,423	19 6
Carn Brea	286	1,722	7 6
Levant	229	1,203	15 0
East Carn Brea	164	850	3 0
Treloweth	125	829	9 0
Pendeen Consols	110	355	5 0
Copper Hill	108	465	11 6
Par Consols	102	617	19 0
Rosewarne Consols	92	679	0 6
Wheal Anna	91	534	12 6
Great South Tolgus	87	768	10 6
Rosewarne United	74	501	18 0
Botallack	72	467	9 0
Wheal Buller	69	239	15 6
New Rosewarne	66	£887	14 0
Charlotte United	61	393	14 0
West Fowey	40	439	0 0
Higgins's Ore	32	44	0 0
Treworlis	23	106	7 6
Alfred Consols	22	154	0 0
Boiling Well	18	43	13 0
Great Alfred	11	45	13 0
Boscawell	11	62	19 6
South Dolcoath	11	132	11 0
Great Wheal Fortune	8	65	0 0
Unity Consols	7	53	18 0
Camborne Consols	4	38	8 0
Borlase's Ore	3	10	14 6

EACH COMPANY'S PURCHASE.

Tons.	Amount.	Tons.	Amount.
1 Vivian and Sons	632	£3,475	14 6
2 Freeman and Co.	133	1,128	0 6
3 Grenfell and Sons	333	1,910	15 0
4 Crown Copper Co. *	—	—	—
5 Sims, Williams & Co. ...	241½	1,352	16 8
6 Williams, Foster & Co. ...	579½	3,280	13 7
7 Mason and Elkington ...	423	2,771	13 0
8 Bankart and Sons ...	82	393	6 6
9 Copper Miners' Co. ...	68	£470	18 0
10 Charles Lambert	82½	237	15 8
11 Newton, Keates & Co. ...	—	—	—
12 Sweetland, Tuttle & Co. ...	39	84	16 6
13 Penclawdd Copper Co. ...	40	292	0 0
Total	2,654	£15,448	9 6

Average Produce, 6½.
Quantity of Fine Copper, 169 tons 7 cwts.Average Standard £134 6 0
Average Price per ton 5 16 6

* The purchases made by No. 4 (Crown Copper Co.) are included in the total of No. 6 (Williams, Foster & Co.), those firms being identical.

Copper Ores.

Sampled Feb. 3, and sold at the Royal Hotel, Truro, Feb. 18.

Mines.	Tons.	Pur- chasers.	Price.	Mines.	Tons.	Pur- chasers.	Price.
Devon Great Consols	140	2	£5 6 6	East Caradon	65	13	£5 18 6
	139	6	6 0 6		44	1	10 1 6
	135	1	6 4 0		56	1	9 4 6
	133	6	6 11 0		50	2, 9	8 10 0
	130	7	5 19 6	Marke Valley	83	6	2 12 6
	127	6	5 16 0		82	6	2 15 0
	126	12	1 17 0		61	3	2 18 0
	123	1	4 15 6		60	3	3 0 0
	120	3	6 0 0		50	3	3 3 6
	118	9	5 14 0		40	3, 6, 9	5 13 6
	114	3	6 2 6		35	1	2 2 0
	113	5, 7	5 5 0	Devon and Cornwall	102	12	2 2 6
	109	4, 6	5 4 6		101	12	2 7 6
	108	5	4 5 6		95	9	3 17 0
	106	5	2 14 6		30	2	14 0 6
	104	5	6 3 6	Bedford United	102	3, 8	5 3 6
	87	10	2 11 6		98	4, 6, 8, 13	6 9 6
	82	4, 6	6 9 6	Brookwood	47	8	5 1 6
	80	3	4 11 6		41	1, 8	4 7 6
	79	5	2 12 6		39	8	9 16 6
	67	12	1 8 6		23	1, 5	2 4 0
	64	4, 6	4 14 0	Wheal Crebor	69	7	4 7 6
	60	5	12 16 0		49	7	3 11 0
	55	6	2 18 0	Wheal Friendship	70	1	10 6 6
	51	2, 5	13 2 0		41	1	7 18 6
	44	5	3 1 0	Bampfylde	63	13	10 12 6
	6	1	47 0 0	North Robert	46	6, 9	4 19 0
	4	1	48 0 0	Sortridge Consols	42	7	5 6 0
East Caradon	90	1	5 16 6	South Bedford	42	4, 6, 7	2 12 6
	83	1	5 14 0	Wheal Arthur	29	8, 13	3 12 0
	77	1	6 5 6	Furdon	18	12	3 17 6

TOTAL PRODUCE AND VALUE.

Tons.	Amount.	Tons.	Amount.
Devon Great Consols	2,621	£14,185	7 0
East Caradon	485	3,452	1 0
Marke Valley	411	1,259	10 6
Devon and Cornwall	328	1,243	2 6
Bedford United	200	1,162	8 0
Brookwood	150	851	13 6
Wheal Crebor	118	475	16 6
Wheal Friendship	111	£1,047	13 6
Bampfylde	63	669	7 6
North Robert	46	227	14 0
Sortridge Consols	42	222	12 0
South Bedford	42	110	5 0
Wheal Arthur	29	104	8 0
Furdon	18	69	15 0

EACH COMPANY'S PURCHASE.

Tons.	Amount.	Tons.	Amount.
1 Vivian and Sons	816	£5,773	6 9
2 Freeman and Co.	220½	1,712	16 0
3 Grenfell and Sons	549½	2,639	9 10
4 Crown Copper Co.	—	—	—
5 Sims, Williams & Co.	591½	3,147	0 6
6 Williams, Foster & Co.	987½	5,029	13 4
7 Mason and Elkington	360½	1,808	11 0
8 Bankart and Sons	196½	1,186	3 0
9 Copper Miners' Co.	274½	£1,440	7 4
10 Charles Lambert	87	224	0 6
11 Newton, Keates & Co.	—	—	—
12 Sweetland, Tuttle & Co.	414	854	19 0
13 Penclawdd Copper Co.	167	1,265	6 9
Total	4,664	£25,081	14 0

Average Produce, 5½.

Quantity of Fine Copper, 276 tons 11 cwts.

Average Standard

Average Price per ton

Sundry Copper Ore Sales.

Dates.	Mines	Tons. c. q.	Price per ton.	Purchasers.	Amount of Money.
Jan. 2.	Okel Tor	37 0 0	0 12 0	Landore Co.	233 8 10
"	"	47 4 2	3 14 6	ditto	
"	"	19 16 0	1 16 0	ditto	
" 18.	Great Laxey (ex Black Diamond)	37 0 0	5 13 9	St. Helen's Co.	210 8 9
" 19.	Knockmahon (ex Mary Curran)	32 10 0	9 17 6	Newton, Keates & Co.	1,929 13 9
"	"	32 10 0	9 17 6	St. Helen's Co.	
"	"	65 0 0	9 15 9	Bibby, Sons & Co.	
"	"	65 0 0	10 0 6	Newton, Keates & Co.	
" 27.	Okel Tor	32 1 0	2 4 6	Landore Co.	549 7 10
"	"	91 10 2	5 4 6	ditto	
Feb. 1.	Gawton	70 10 0	—	—	263 4 3
" 17.	(Parys Mines) —				
Lot 1	(copper ore)	145 0 0	6 12 0	Mona Co. & J. Radley	
2	"	145 0 0	6 12 0	Mona Co.	
3	"	65 0 0	2 17 6	ditto	
4	"	65 0 0	2 17 6	C. Lambert	
5	(precipitate)	40 0 0	19 15 6	Mona Co.	
6	"	20 0 0	11 16 6	ditto	

Copper Ores.

Sampled Jan. 6, and sold at Swansea, Jan. 26.

Mines.	Tons.	Pro-duce.	Pur-chasers.	Price.	Mines.	Tons.	Pro-duce.	Pur-chasers.	Price.
Cobre	94	11½	3	£12 1 0	Connorree	53	3½	7	£2 18 0
	90	11½	1	11 16 0		44	3½	7	2 18 0
	88	11½	3	11 19 0		38	3½	7	2 18 0
	85	11½	6	12 2 0		6	5½	5	4 6 6
	78	11½	7	11 17 6	Spanish	73	5½	14	5 14 0
	50	24½	6	24 4 0	Cape Copper	35	32½	9	33 6 6
(Precipitate) 13	56	6	6	52 0 0		9	22½	9	22 11 6
	47	23½	5	23 15 6	Knockmahon ...	70	11½	7	12 9 6
(Regulus) 38	29½	6	6	29 11 0		52	12	7	12 10 6
	36	29	3	29 11 0		41	11½	5	12 2 6
Berehaven	124	9½	10	10 3 6	Daley	24	23½	10	24 17 6
	86	10½	10	10 16 6	Kanyaka Road ...	24	27	1,9	26 10 6
	61	10½	14	10 18 0	Cuba	67	6½	2	6 3 0
	19	9½	10	9 15 6		59	6½	10	6 0 6
						47	6½	7	6 2 6

TOTAL PRODUCE AND VALUE.

	Tons.	Amount.		Tons.	Amount.
Cobre	619	£10,391 3 6	Knockmahon	163	£2,021 13 6
Berehaven	290	3,043 5 6	Daley	24	597 0 0
Connorree	141	418 5 6	Kanyaka Road	24	636 12 0
Spanish	78	416 2 0	Cuba	173	1,053 18 6
Cape Copper	44	1,369 11 0			

EACH COMPANY'S PURCHASE.

	Tons.	Amount.		Tons.	Amount.
1 Copper Miners' Co.	102	£1,380 6 0	10 Bankart and Sons	312	8,329 7 6
2 Freeman and Co.	67	412 1 0	11 Charles Lambert	—	—
3 Grenfell and Sons	218	3,248 2 0	12 Ravenhead Copper Co.	—	—
4 Crown Copper Co.	—	—	13 Sweetland, Tuttle & Co.	—	—
5 Sims, Wilkyns & Co.	94	1,640 4 0	14 Jennings & Co.	134	1,091 0 0
6 Vivian and Sons	186	4,637 8 0	15 Penclawdd Copper Co.	—	—
7 Williams, Foster & Co.	382	3,131 6 0			
8 British and For. Copper Co. —	—	—	Total	1,551	£19,947 11 6
9 Mason and Elkington	56	1,687 17 0			

No Sale on February 16.

Black Tin Sales.

Dates.	Mines.	Tons c. q. lbs.	Price per ton.	Purchasers.	Amount of Money.
Jan. 21.	Leeds & St. Aubyn ...	4 2 0	21 ... 67 0	Chyandour	276 6 6
" 23.	New Birch Tor	9 4 1	21 ... —	Harvey & Co.	627 1 9
	Kitty (St. Agnes)	22 18 2	10 ... 69 10	Bolitho & Co.	1,589 11 6
	East Wheal Grenville ...	4 5 2	1 ... 73 5	Bissoe Co.	313 4 2
" 27.	Pendeen Consols	10 2 1	1 ... 67 10	—	682 12 6
	Wheal Grenville	7 4 0	10 ... 73 5	Bissoe Co.	570 8 6
	"	0 13 0	25 ... 45 0	ditto	289 4 6
" 28.	Gurlyn	4 8 0	26 ... 69 10	Chyandour	109 2 7
" 30.	North Wheal Jane	1 12 3	8 ... 66 10	Daubuz & Sons	566 16 10
Feb. 4.	New Birch Tor	8 1 3	23 ... —	Enthoven & Sons	380 3 10
	Pendeen Consols	5 9 3	6 ... 69 5	Michell Co.	1,366 19 0
	Wheal Grylls	21 1 1	15 ... —	Treriffe	1,131 12 1
	Great Wheal Busy	17 18 1	1 ... —	—	1,790 0 0
	St. Just United	26 6 0	0 ... —	—	76 15 11
" 5.	Bagtor	1 2 3	10 ... 67 5	Harvey & Co.	582 8 2
	West Beam	7 11 1	27 ... 70 12	ditto	—
	"	0 18 2	23 ... 69 5	ditto	—
	Prosper United	5 12 2	2 ... 70 15	W., G. & F. M. Williams	1,020 1 7
	"	2 3 0	14 ... 61 0	ditto	—
	"	6 1 0	24 ... 69 5	Bolitho & Sons	335 6 5
	"	1 5 1	6 ... 56 0	ditto	5,729 1 9
" 8.	Wheal Sidney	4 11 0	10 ... 73 12	Calenick Co.	322 5 0
" 13.	Great Wheal Vow	75 2 0	7 ... —	—	—
	Pendeen Consols	4 13 0	8 ... 69 5	Bolitho & Sons	—

Blende Sales.

Dates.	Mine.	Tons c. q.	Price per ton.	Purchasers.	Amount of Money.
Nov. 26.	South Lisburne	58 4 1	... 5 9 0	Vivian & Sons	593 11 6
Dec. 29.	"	53 3 0	... 5 4 0	Dillwyn & Co.	—

Lead Ore Sales.

Dates.	Mines.	Tons.	Price per Ton. £ s. d.	Purchasers.	Amount of Money. £ s. d.
Jan. 2.	Clara United.....	54	13 2 6	Panther Co.	72 8 9
" 15.	Cargoll.....	59	17 5 6	Michell & Son	1146 6 0
" 20.	Silver Mountain.....	12	9 15 6	Trefry's Trustees	352 13 9
" 22.	Wheal Trelawny.....	24	14 5 0	Sims, Williams & Co.	1,744 10 0
" 23.	Isle of Man Mining Co.	60	29 1 6	Sims, Williams & Co.	2255 0 0
" 28.	Mount Pleasant.....	100	22 11 0	Newton, Keates & Co.	70 15 0
	Hendre Ucha.....	5	14 3 0	Walker, Parker & Co.	268 13 0
	Bryngwyn.....	18	14 13 6	Walker, Parker & Co.	270 0 0
		13	15 0 0	ditto	
		21	15 0 0	Newton, Keates & Co.	115 4 0
	Pant-y-Mwyn.....	9	12 16 0	A. Eyton	326 5 0
	North Henblas.....	25	13 1 0	Walker, Parker & Co.	118 0 0
	East Pant Du.....	8	14 15 0	Brymbo Co.	174 12 0
	Llanerchyrour.....	6	14 11 0	A. Eyton	148 15 6
		6	14 11 0	Newton, Keates & Co.	300 16 6
	Cavlan.....	11	13 10 6	Walker, Parker & Co.	937 2 6
	Roman Gravela.....	21	14 6 6	ditto	179 7 6
	Dyliffe.....	63	14 17 6	Brymbo Co.	1065 18 0
	Dyffrynwm.....	124	14 7 0	Walker, Parker & Co.	1982 12 6
	Talisker (Australia).....	57	18 14 0	Michell & Son	259 0 0
" 30.	Ludcott & Wrey Consols.....	50	19 1 6	Trefry's Trustees	1390 0 0
	".....	45	17 15 6	ditto	706 0 0
	".....	40	5 14 6	ditto	
	Cwmbrane.....	20	12 19 0	Sims, Williams & Co.	259 0 0
Feb. 1.	Cwmystwith.....	100	13 18 0	ditto	1390 0 0
	Glogfach.....	40	17 13 0	Stock & Co.	706 0 0
" 2.	Frank Mills.....	90	16 6 6	J. & J. Williams	2454 10 0
" 3.	Minera Union.....	70	14 1 6	Trefry's Trustees	299 15 6
" 4.	Wheal Mary Ann.....	21	14 5 6	Jenkins Brothers.....	1358 15 0
" 5.	Minera.....	50	27 3 6	Stock & Co.	
	".....	100	14 19 0	Brymbo Co.	
	".....	100	14 15 0	ditto	
	".....	100	14 19 0	ditto	
	".....	100	14 15 0	ditto	
	".....	70	14 19 0	ditto	
	".....	100	15 1 0	ditto	
	".....	70	15 1 0	ditto	
	Dyliffe.....	46	14 15 6	Newton, Keates & Co.	1270 13 0
	".....	20	14 15 6	ditto	
	".....	20	14 15 6	Walker, Parker & Co.	
" 6.	Bronfloyd.....	50	15 3 0	Mining Co. of Ireland.....	757 10 0
" 11.	Talargoch (Maesyrrwddu).....	47	15 6 6	A. Eyton	2379 4 3
	(Coetia Llys).....	104	15 17 6	ditto	
	Deep Level.....	15	14 1 6	Newton, Keates & Co.	211 2 6
	Brynford Hall.....	7	14 10 6	Walker, Parker & Co.	101 13 6
	Parry's.....	21	14 18 6	ditto	311 6 6
	Bryn Gwiog.....	45	14 19 0	A. Eyton	672 15 0
	Long Bake.....	26	14 11 6	Walker, Parker & Co.	378 19 0
	Speedwell.....	5	13 18 6	Brymbo Co.	69 12 6
	East Merilyn.....	2	14 18 6	Newton, Keates & Co.	29 17 0
	Chware Las.....	3	14 18 6	ditto	44 15 6
	Holywell Level.....	7	15 17 6	ditto	101 2 6
	Pennant.....	10	14 4 6	Walker, Parker & Co.	142 5 0
	Merilyn.....	6	13 10 0	Newton, Keates & Co.	81 0 0
	Llangynog United.....	33	14 3 6	Brymbo Co.	467 15 6
	Caeconroy.....	11	15 1 6	Newton, Keates & Co.	173 7 3
	Roman Gravela.....	20	14 2 6	Walker, Parker & Co.	292 0 0
	Dyffrynwm.....	17	14 1 6	ditto	239 5 6
" 12.	Cargoll.....	60	17 16 0	Trefry's Trustees.....	1086 2 0
	".....	4	4 10 6	ditto	
" 15.	Dyliffe.....	78	14 16 6	Walker, Parker & Co.	1156 7 0
	Frongoch.....	50	14 7 6	Mining Co. of Ireland.....	1440 0 0
	East Darren.....	50	14 8 6	ditto	1214 10 0
	Goginan.....	70	17 7 0	ditto	626 3 0
	".....	22	19 16 6	ditto	
	Cwm Erfin.....	10	19 0 0	R. Michell & Son	
	".....	25	17 2 6	Trefry's Trustees.....	1060 15 0
	".....	35	18 1 6	ditto	

THE
MINING AND SMELTING MAGAZINE.

APRIL, 1864.

*On the New Form of Blast-Furnace Invented by
General Rachette.*

BY DR. L. BECK, OF THE METALLURGICAL LABORATORY,
ROYAL SCHOOL OF MINES.

THE new form of blast-furnace invented by General Rachette, has not yet received in this country the amount of attention which it appears to deserve; although the inventor was rewarded with a prize medal at the last International Exhibition. On the continent it continues to attract a lively and increasing interest; for the various reports of the working of the new furnaces—especially those in operation at several Russian iron works—are so exceedingly favourable, that no doubt can any longer be felt as to their practical application. As the principal alleged advantages of these new furnaces are their small cost of construction, their easy management, and their large make, a fair investigation of their merits seems to me particularly important in this country.

The general arrangement of this new blast-furnace is as follows: The interior form is that of a truncated quadrilateral pyramid, the base of which forms the throat, and the truncated section the bottom; the horizontal section being that of a narrow elongated rectangle. The height of the furnace is comparatively inconsiderable. The two long sides of the rectangle forming the hearth are provided with a large number of parallel twyers, placed alternately—that is, one being always midway between each two on the opposite side. The body widens continuously to the throat; and each of the short sides of the hearth is provided with a tymp-arch. Underneath the bottom there is a separate fire-place connected with a system of pipes for drying and heating the furnace before blowing in.

With regard to the history of this new form of furnace, it is to be remembered that elliptical furnaces have been long in use in Sweden and in England for roasting ores. A blast-furnace with an elliptical hearth was also constructed many years ago at Finsbone, in Sweden, which, however, was only provided with a few twyers placed in a converging position. For copper smelting also, furnaces with an elongated hearth, and a great numbers of twyers, have long been in operation at Ätvidaberg. The first, however, to transfer the well known principle of refining fires—namely, long and narrow hearths with a great number of twyers—to the construction of iron blast-furnaces, were Mr. Alger, in the United States, and Herr Abt, in Germany. The latter, however, only made a proposition to that effect in a technical journal in the year 1850; while Mr. Alger introduced his idea into practice, and patented his proposed form of construction in America in 1857, and in England in 1859, exciting some interest in this country. He selected for his hearth an elongated elliptical form; and it is reported that old furnaces rebuilt according to his system gave very good results. The first furnace constructed on his system was built at Newborough, New York, U.S. In the case of another old furnace at Fort Edward, the monthly make of which had been 600 tons, after being remodelled on Alger's system, the make rose to 999 tons, the consumption of coal being only 1,175 tons, or 1 ton, $3\frac{1}{2}$ cwt. per ton of iron. The cost of alteration in this case was said to have been small, whilst the profit per month amounted to 400*l*. (vide *Mining Journal*, 1859, No. 1,273). In the year 1859 "Alger's Patent Furnace Company (Limited)" was formed in London; and experiments made at Cleveland were said to have had the best results, producing an increase in the make of 50 per cent., whilst the consumption of coal for an equal quantity of iron was reduced. Notwithstanding all these statements, Mr. Alger's alterations were not found to be finally satisfactory. He only changed the shape of the hearth, retaining in all other details the usual forms of blast-furnaces; indeed he seems to have confined his new system almost exclusively to remodeling old furnaces by furnishing them with an elliptical hearth.

The same idea has been elaborated and practically carried out by General Wlademer Rachette, a Russian mining engineer, and manager of many of the large copper and iron works of Prince Demidoff on the European and Asiatic sides of the Ural Mountains, near Nischne Tagilsk. At these works Rachette for many years experimented on a large scale as to the best form of blast-furnace, and quite independently of Mr. Alger he arrived at nearly similar results, that is, the construction of a hearth of a narrow and elongated section.

The first furnace constructed after this method, with twenty-four twyers, was erected in the year 1859, at Nischne Tagilsk, for smelting copper-regulus on a large scale. During the winter of that year the first furnaces for smelting the rich magnetic iron ore (magnetite) of that district, which is so difficult to reduce, were put in operation; and in a short time three of these improved furnaces were at work in the Nischne Tagilsk district: that is the first one of this kind erected at Nischne Tagilsk itself, a second at

Werchna, and a third at Salda. New works with these Rachette furnaces were opened in the winter of the year 1861—62 at Wirschisetzky, and during the summer of 1862 another one was erected at Nischne Turinsk, in the Ural Mountains. All these furnaces are worked with charcoal.

Furnaces for smelting copper ores increased with the same rapidity, and in 1860 a furnace very similarly constructed was erected at Fahlun, in Sweden, with four twyers on each long side. In the middle of the year 1861 furnaces constructed after this method were erected at the Imperial copper works at Bogolowsk and Perm. At the latter works black copper is smelted, obtained from a sandstone containing carbonates of copper.

During the last year experiments with these furnaces have also been made in Germany, though on rather a small scale, by Herr Hartmann at Saalfeld, with the copper-schist of Mansfeld. The operation proceeded with such facility and regularity that the fusible ores could be smelted without any "noses" (a slag prolongation of the twyer).

The most recent of Rachette's furnaces, the first one constructed for smelting iron with coke, has just been erected at Mühlheim, on the Rhine, in Westphalia, and was expected to be put in operation at the end of March. It has been constructed by Aubel, formerly engineer under General Rachette; and the largest iron-masters of Westphalia are shareholders in the company which has erected these new works at Mühlheim. All the German ironmasters regard these works with the greatest attention, for here they look to decide the question whether these furnaces will give the same advantageous results when coke is employed as they have given with charcoal. Most persons, taking an interest in the metallurgy of iron, are very sanguine in their expectations, perhaps too much so; but at any rate it will decidedly depend upon the results obtained at these works whether, as many persons are inclined to believe, this new form of construction will not entirely replace the old one. The extent of the expectations which have been raised on this subject may be judged from the fact that the Bohemian ironmasters have petitioned the Austrian Government to make experiments with these furnaces at the Imperial ironworks.

In the following description of these new furnaces I shall refer chiefly to blast-furnaces for smelting iron, only occasionally mentioning those used for smelting copper, although the advantages of this form of construction have been found to be everywhere greater for copper smelting than for the working of iron; a result, however, not so much to be attributed to their superior fitness for copper smelting as to the fact that the furnaces formerly employed for the treatment of copper ores were much inferior to the old forms of iron blast-furnace, as compared with the new furnaces.

Most of my data as to the construction and results of these furnaces are taken from a notice by M. Aubel, "*Das Raschettische System der Patent-Normal- und Universal-Schachtofen*." Leipzig: Verlag von E. H. Mayer, 1863." The accompanying cuts will enable the reader more readily to understand the description given.

The principal difference between Rachette's furnaces and those

FIG. 12.

VERTICAL SECTION ACROSS FURNACE.

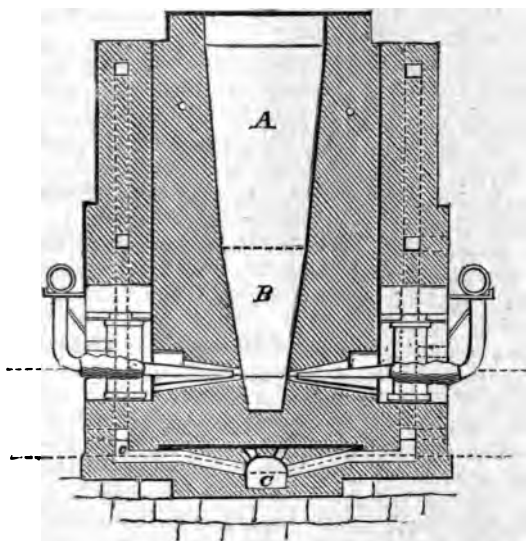
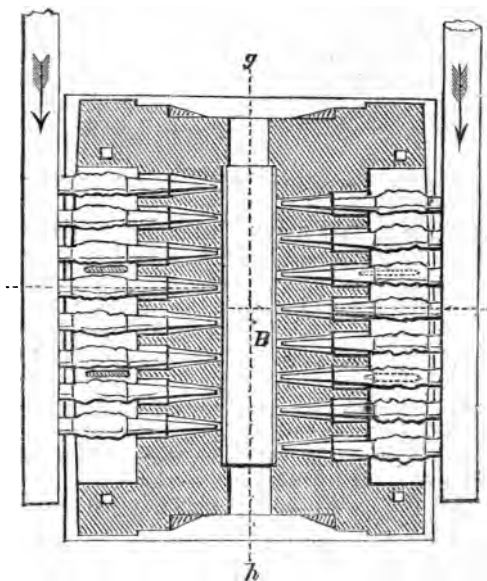


FIG 13.

HORIZONTAL SECTION OF FURNACE ABOVE TWYERS.



constructed on the ordinary system is the narrow and elongated section of the hearth. To increase the rate of production in the old furnaces, the diameter of the region of fusion between the twyers was enlarged as much as possible; but experience has shown that this is only practicable within certain narrow limits, beyond which a further enlargement of this region is disadvantageous. With refractory ores this limit does not exceed from 5' to 6', for with a hearth of larger diameter the blast would not penetrate sufficiently to obviate the danger of irregular fusion. With easily fusible ores the diameter of the hearth may be a little larger, as is the case throughout Scotland; but in Belgium and Westphalia, where these proportions had been imitated, it was found to be impracticable, and all the recent furnaces there have been constructed with narrow hearths. An attempt to distribute the blast more effectually by increasing the number of twyers has also been unsuccessful, since the smaller jets of blast, generally with a diminished pressure, were found to penetrate still less into the heart of the mass in the hearth.

Professor Tunner, of Leoben, was the first to show by experiment that in blast-furnaces a separate space of combustion is formed before every twyer, elongating in the direction of the blast not more than about $1\frac{1}{2}$ ' towards the middle of the hearth. The heart of this space forms a focus of combustion commencing from about 4—6" from the mouth of the twyer and extending for 6". In this focus the highest temperature is produced—melting wrought iron and, according to Aubel's experiments, even pure platinum. Not less than 3' above the level of the twyers these separate foci disappear. Greater or less pressure will move the space of combustion more or less towards the middle of the hearth, but the variation is not great, and the elongation of the focus itself is scarcely observable. It is easy to ascertain and test the correctness of these conclusions by introducing an iron bar through the mouth of the twyer into the interior of the hearth. If it is pushed forward to the middle, and kept in the furnace for half-a-minute, the focus will be distinctly shown on the bar by a bright white space, commencing 6" from the mouth of the twyer and extending 6"; while the 6" on each side of the focus will appear of a bright red heat—thus showing the whole space of combustion. Beyond these limits the bar will remain dark. If another bar is put through to the opposite twyer, the two foci will appear distinctly. Care must be taken that the bar does not get into the fluid slags, which would interfere with the experiment. If the bars remain about two minutes in the furnace, they will melt just in the two foci.

From these observations it will be seen how unequally the temperature is distributed in a hearth of circular section of great diameter, and how much more practicable it must be to make the hearth narrow, and to provide it with a great number of twyers, arranging them alternately like Rachette. The practicability of this will be the more evident when it is remembered that the larger and less prepared lumps of ore have, from the ore descending quicker than the fuel, a tendency towards the middle of the hearth, where the lowest temperature prevails. Experiments have also shown, that it is inconvenient to arrange the twyers in such a manner as to

be directly opposite to each other, because by the concurrence of the jets of blast its distribution and the combustion may be irregularly effected; whilst it has been found most advantageous to arrange the twyers alternately, that is, one midway between two on the opposite side. By increasing the number of twyers, and distributing them so that all the separate spaces of combustion touch each other, a zone of fusion of the highest and most equal temperature is obtained, in which Herr Aubel succeeded even in smelting nickel and platinum. It is General Rachtette's opinion that these furnaces may be employed for smelting platinum directly from rich platinum sands.

The width of the hearth for the rich magnetic iron ore of the Ural, which always contains some silica, has been found to be $2\frac{1}{2}'$ at the maximum, charcoal being employed. For poorer and less refractory ores the width must be larger, because otherwise scorification of a part of the ore would take place: Herr Aubel believes a diameter of $3'$ to be the most convenient under such circumstances. A width of $3\frac{1}{2}'$ has been found to be most suitable for smelting the sulphides and oxides of copper. For smelting ores of such fusibility as the copper schist of Mansfeld, $3\frac{3}{4}'$ will be best adapted. Herr Hartmann made his small furnace, in which he experimented at Saalfeld, only $3'$ wide and $4\frac{1}{2}'$ long. If platinum or nickel should be smelted, $1'$ would certainly be the greatest width admissible.

Under these circumstances the rate of production depends on the size of the area between the twyers—that is the region of fusion. But as the width of the hearth is limited, the greater its length is the greater will be the production. With this lengthening of the sides it is necessary to have two tympan-arches on the two short sides or ends of the hearth. The length of the hearth is limited by the increased difficulty of cleaning its bottom with the increased length: $20'$ is the greatest length employed, but from $16'$ to $18'$ on the exterior is the general length both for copper and iron furnaces. The cleaning of the hearth is always rather difficult, and is effected with two long and heavy iron bars. The greatest interior length of a copper furnace is $16\frac{1}{4}'$, but of an iron furnace only $13\frac{1}{4}'$, in consequence of the greater thickness of wall required for the hearth of iron furnaces. The area between the twyers of a furnace $3'$ wide and $13'$ long is nearly the same as of a round furnace of $7'$ diameter in the hearth.

The twyers are placed parallel to each other, which is very advantageous in comparison with Alger's furnace, or with any furnace with an elliptical section of hearth, the twyers of which blow more or less convergent, by which the distribution of the blast cannot be so equally effected. If only one twyer is employed the circular form of the hearth is the most suitable, but in the ordinary round furnaces with several twyers, the spaces of combustion always form a complete ring in the hearth.

A third characteristic of the new form of furnace is its comparatively small height. With copper furnaces the best results have been obtained with a height of $13'$. The first iron blast-furnace of Rachtette at Nischne Tagilsk was $22'$ high; and in this the charges of magnetic iron ore, which is difficult to reduce and contains from

66% to 70% of iron, arrived in the zone of fusion completely prepared in seven hours; from which the best grey pig-iron was produced. It was found, however, that to get the greatest make a somewhat greater height is advisable, and 29' or 30' seems to be the most suitable when charcoal and ores like those of the Ural are employed, whilst in working with coke and less refractory ores the height may be probably reduced to 24'. This small height is chiefly the consequence of the increase in the width of the furnace towards the throat, the volume of the furnace increasing so much more quickly by this means than is the case with the ordinary mode of construction. This small elevation does not interfere with the fusion of the ores, as is clearly shown by the results obtained at Nischne Tagilsk, where the rich ores arrive before the twyers completely prepared seven hours after being charged. This experience is of great interest, because a period of at least sixteen hours was always believed to be necessary for a perfect preparation. But this small height of the furnace and the quick descent of the charges affords also an important advantage by allowing the process to be easily regulated; for the only sure remedy for irregularity is by modifying the charge, the effect of which can be quickly ascertained in these low furnaces, while in the old high furnaces this could not be done until from sixteen to twenty-two hours after charging, when of course it was often too late.

It must be remembered however, that a higher body allows of a more perfect utilisation of the gases of combustion, and in this respect a somewhat higher furnace will be always more advantageous. But the low furnaces are less expensive in their construction, as well as in the accessory appliances of inclined planes, lifts, &c. They also require less power in the blast-engines as the lesser column of material requires a much smaller pressure in the blast.

As before mentioned, the small height of the furnace is the consequence of the widening of the body towards the throat. A glance at the cuts will show how the width increases regularly all the way up. In copper furnaces the sides slope in a single plane with perfect regularity from top to bottom, so that in these furnaces it is impossible to make any of the distinctions of hearth, boshes, and body as in the ordinary furnaces. The two short sides (or ends) of these furnaces are perpendicular, the long sides only being inclined. The increase of width is from $3\frac{3}{4}$ ' at the bottom to 5' at the throat, in a furnace of 13' high. In iron furnaces, as shown by Fig. 12, the ends too are somewhat inclined, and the part B has the appearance of a body or very steep boshes. The increase of width in an iron furnace 30' high is from $2\frac{3}{4}$ ' at the bottom to 7' at the throat. In iron furnaces of this construction the area of the section of the throat is generally two and a-half times that between the twyers', while in copper furnaces it is only one and a-half times.

It is well known that Mr. Truran had already proposed to give a greater width to throats of blast-furnaces; but with the usual form of round furnaces, the diameter of the boshes of which is always so considerable already, there are great difficulties in working with these wide throats, which accounts for their not being adopted. But with Rachette's furnaces this extension is not attended with any

similar difficulty, for there is no trouble in charging a furnace the throat of which is $5\frac{1}{2}$ ' wide. As the tension of the gases is less, and their escape goes on more slowly, so the resistance of the materials charged will be less, because this resistance increases in proportion to the square of the velocity of the gases: the blast need not consequently be of high pressure. By the retarding of the gases in the upper part of the furnace more heat is brought to bear on the charge; a circumstance of great importance with such a small height, for by this means only is there any possibility of the ores being completely prepared. I have no information as to the temperature of the gases escaping from the throat and I believe that in spite of the comparatively better utilisation of the gases, the small height of the furnace must cause a considerable loss of heat; very probably the temperature at the throat is higher than 50° C. (122° Fahr.), as in the charcoal furnaces with narrow throats in Styria.

But another, and possibly the greatest advantage of this width of the throat—and to which is probably partly due the success obtained by this form of furnace—is that it facilitates the regular descent of the charge. In an ordinary blast-furnace with a wide throat, but in which the section of the boshes is still the largest area, the charges of fuel and ores become loose and separated as they descend from the throat to the wider portions, thus allowing the lumps of ore (being heavier) to fall down between the coke or charcoal—and as this will occur more in the centre of the furnace, the fuel will accumulate towards the sides and the ore towards the centre. This quicker descent of the ores causes great inconvenience, giving rise to waste of fuel and irregular fusion. The descent of the fuel, accumulated at the sides, is checked at the boshes, and a great portion of it burns away ineffectually, while on the other hand the largest pieces of ores, which require longer time and a higher temperature, fall into the centre of the furnace where the temperature is lowest. It will thus be seen how much more advantageous it is to have the ore charged all of the same size. It is a great mistake to suppose that the charge remains intact while descending in the furnace; for on the contrary, according to Tunner's experiments, the ores descend much quicker than the fuel, often in half the time. This important defect is completely remedied by Rachette's system. In the regularly contracting body of his furnaces the charges cannot become loose as they descend. This contraction should be made, however, to correspond as much as possible with the contraction of the charges—which themselves contract as they descend, from the reduction of the ores and the combustion of the fuel. It has been ascertained by experiment that the thickness of the respective charges remains unaltered at any given height notwithstanding the contraction of the body. The descent also of the charges was found to occupy the same time at any height, namely 1' in from 31 to 32 minutes; whilst in the round furnaces the rate of descent is slower in proportion to the depth. In the ordinary form of furnace the quicker descent of the ore part of the charge is partly checked by charging the ores, especially the larger lumps, more towards the sides; but in Rachette's furnaces this precaution is unnecessary,

indeed the opposite practice has been found to be most advantageous, and the ores are generally charged in a horizontal layer near the middle of the throat. The object of this is to prevent the ores from descending too close to the long sides of the furnace; in which case, in consequence of the narrow hearth, the jets of blast cool the ore on striking it without fuel close to the mouths of the twyers, which would then become dark. This precaution must not be omitted, especially on the first blowing in. In one case where the furnaces, on first being blown in, were charged in the ordinary manner, their working was interrupted by "bears" being formed in the hearth. In copper furnaces, however, the materials must be charged in the opposite manner to that above described, the ore being placed close to the two long sides, while the fuel is placed towards the centre. In this case "noses" are made in the smelting. With less refractory ores no "noses" are required, and consequently no care is necessary in charging, as seems to be the case, according to Hartmann's experiments, with the copper schist of Mansfeld. But I am inclined to believe that smelting with "noses" will always be found to be more advantageous, especially considering the rapid wearing away of the sides of the hearth when they are not introduced.

The distribution and position of the twyers have been already referred to. Their number depends upon the length of the hearth, the diameter of the mouths of the twyers, the pressure of the blast, and the nature of the materials to be heated. Copper furnaces gave the best results with 26 twyers, 13 on each long side, so that the distance of the centres of their mouths was 1'. The iron furnaces have at present only 12 twyers on each long side, the distance of the centre of their mouths being 2'. In making grey pig-iron more twyers might probably be employed. Instead of introducing the blast by separate twyers, it may also be introduced by an aperture extending along the whole length of the sides of the furnace so that the blast enters in the form of a thin film. This method will be found to be most suitable for smelting metals difficult to fuse, such as nickel or platinum.

I have before mentioned that there are two tympan arches on the two short sides (or ends) of the hearth, both provided with tympan and dam. In Styria some blast-furnaces, furnished with two such apertures, have been in use for smelting iron which is made into castings directly from the furnace; but these furnaces have a close hearth (Blauöfen) and no real tympan, therefore these apertures are really only two tap-holes. Alger's furnace has also two tympan-arches. To me it seems likely that this form of furnace, with a closed hearth, might be applicable to smelting superior ores with charcoal and pure coke; even for example under such circumstances, as at Nischne Tagilsk—as the loss of heat on a hearth with double tympan must be very considerable, without taking into consideration the difficulty of cleaning the hearth and the cooling thus produced. In order to convey the fused mass to the two tap-holes, the bottom of the hearth is inclined from the middle towards the two dams, the inclination being 4" in iron furnaces and in copper furnaces smelting regulus, but only 2" in copper furnaces smelting black copper;

because with a greater inclination there might be more incrustation on the ridge in the middle of the hearth. For this reason also it will be better not to tap the whole contents of the hearth, but only so much that this ridge shall always remain covered. The twyers are arranged parallel to the sole of the furnace—in copper furnaces from 2' to 2½' above the sole; the two middle ones have a small inclination to keep the products well fused on the ridge.

(To be continued.)

Improved Mechanical Puddlers,

ADOPTED AT THE CLOS-MORTIER FORGES, HAUTE-MARNE.*

LAST year we gave a translation, from the *Annales des Mines*, of a note by MM. Dumeny and Lemut, on this subject (see *Mining and Smelting Magazine*, Vol. III, p. 266). In the last published number of that periodical we have another note by M. Lemut on the same subject, which not only carries down information to a more recent date, but gives us the result of two years' experience in working. It is difficult to estimate too highly the importance of this subject, particularly in the present state of the labour market in our iron districts.

For the last two years, since the first mechanical puddlers were erected at Clos-Mortier, these apparatus have been the subject of numerous and continuous experiments, by which they have been successively improved and simplified; until, at present, the result of their working at the seven furnaces fitted with them is so satisfactory that there is no hesitation now felt in applying them, without further modification, to all the other furnaces. Besides the mechanical puddlers put up at the Clos-Mortier works, others have been constructed specially suitable to the arrangements of certain furnaces, particularly those that have a steam-boiler above them.

The first mechanical puddler was applied to a furnace with a single door, and it is at work, to the present day, almost as it was put up two years ago. For the detailed arrangements of this, we refer our readers to the *Mining and Smelting Magazine*, Plate IV, Vol. III, merely indicating here (Plate III, Figs. 7, 8, and 9) the general working of the mechanism, which carries the tool over every part of the sole of the furnace in the manner indicated by the diagram, Fig. 3, which shows the ensemble of the lines described by the rabble.

Another form of apparatus has also been constructed, which, like the preceding, engenders a complex movement by which the tool is made to penetrate every part of the furnace; and can yet be

* a Note by M. Lemut in the *Annales des Mines*, vol. iv, p. 505.

arranged at any required distance from the furnace. This new mechanical puddler is simple, strong, occupies but little space, and can be placed either under the floor, or suspended from the roof. In Plate III, Figs. 1, 2, 3, and 4, 5, 6, it is figured in both these positions.

The horizontal shaft *A A*, having at its end the crank *J* (Figs. 1, 2, and 3), receives its movement from the driving band, regulated by the tightening pulley *E*, working over *D*. On this shaft is fixed the endless screw *I*, by means of which a motion 20 or 30 times slower than that of the horizontal shaft is communicated to the small vertical shaft *B* and its crank *L*.

To this crank *L* is attached the two connecting-rods *C* and *P*. The first, *C*, sets in motion the guiding-groove *R R* (placed over the door of the furnace), by means of the lever *K* attached to the lower end of the vertical shaft *F F*, and the lever *m*, attached to its upper end and connected to the guiding-groove by the rod *T*. The other connecting-rod *P* acts on the extremity of a horizontal lever, *O S Q*, which it slowly displaces. At the point *s* of the same lever there is attached the connecting-rod *J M S*, receiving a rapid motion direct from the horizontal shaft *A A* by the crank *J*. It is the end *Q* of this lever that, by the connections *Q U X Y*—which may be contrived in any manner suitable to the arrangements of the furnace—works the swing-rod *H H*, to which is attached the tool *Z*.

Figs. 4, 5, and 6 represent an analogous mechanism, but suspended from the roof. The crank *L* controls the guiding-groove *R R* by means of the rods *C* and *T* connected by the elbowed lever *C F F T*. Another crank *L'* gives a slow oscillating movement to the bar *X O P*, round the fixed axis *X X*. To the intermediate point *O* of this bar is connected the extremity of the lever *O S Q*, upon which acts (at *s*) the connecting-rod *J M S*, working with a quick movement. As in the former instance, it is from the extremity *Q* of this same lever that the motion is transmitted to the tool. The workman stops or puts in motion, quickens or slackens, the working of the apparatus by simply regulating the tightening pulley *E*, and thus letting the driving-band slip more or less. Experience has shown this simple arrangement to be preferable to more complicated constructions.

The tool is attached to the swing-rod *H H* by means of the lateral spur shown in Fig. 13, which is inserted in the ring at the end of the tool, and secured in its place by a key. A few seconds, therefore, suffice to replace a rabble when it has become too hot. But, as the rabbles used in mechanical puddling are much heavier than those that can possibly be worked by hand labour, they stand the action of the fire much longer; so we generally find that only one large rabble is heated in working up the iron, while to effect the same by hand labour 3 or 4 tools would have been heated.

(To be continued.)

The Assaying of Tin Ores.

BY CLEMENS WINKLER.*

THE process in use up to the present time for the assaying of tin ores in the dry way has one great drawback, which is that the assay, even under the highest temperature, rarely forms a single button of tin—the metal obtained being usually found distributed in larger or smaller globules at the bottom of the crucible, in the slag, and even as high up as the charcoal and the covering of salt. It is evident how much this must affect the accuracy of the assay; for even if it were possible carefully to examine the slag, and collect and weigh the grains of tin distributed through it, many of these would evidently escape detection, and only an incomplete result could consequently be obtained. The loss of tin by this means amounts to 5%, 10%, or even more.

Tin has this peculiar property, that the globules formed during its reduction, even under the most fusible slag and in the most immediate contact, do not run together into one button even at a very high temperature. This has been generally attributed to the iron and wolfram present in the ore, but in my opinion it cannot be entirely ascribed to this cause, for a similar phenomenon seldom fails to occur even in the reduction of pure artificially-prepared oxide of tin, reduced at a very strong white heat for 1½ hour.

With results thus obtained, the assayer cannot help feeling some degree of uncertainty, and in order to obviate this I have endeavoured to modify the ordinary mode of proceeding, by adding to the assay another medium for the purpose of collecting together the tin,—which endeavours have been attended with the most satisfactory results. But even with these modifications, it is impossible to dispense with the usual but often troublesome wet process, as the iron must under all circumstances be removed from the ore.

The assaying of tin ores is classed into three processes:—

1. The Roasting;
2. The Lixiviating of the Iron; and
3. The Reduction.

1. THE ROASTING.—After the ore to be treated has been finely ground, 1 assay standard (*Probircentner* = 57·9 grs. English) of it is placed in a roasting pan, over which it is spread equally, and thoroughly roasted—first by itself, and then with the addition, sometimes repeated once or twice, of pulverised charcoal or coke.

2. THE LIXIVIATION OF THE IRON.—After having been again pulverised, the roasted ore is poured into a small beaker—any remaining attached to the roasting pan being carefully removed by a fine brush—after which the oxide of iron in the ore is dissolved by digesting for from a quarter to half an hour with hot hydrochloric

* From the *Berg- und Hütten. Zeit.* No. 3, 1864.

acid. The pulverised ore is then well washed with hot water and dried. This removal of the iron can be more energetically effected by melting the tin ore with three times its weight of bi-sulphate of potash (which can be easily done in porcelain crucibles), then by treating with hydrochloric acid. The assay is then boiled in extremely diluted hydrochloric acid, any attaching to the crucible being washed out, and the new light-coloured tin ore is digested with warm water. If the ore contains any considerable quantity of wolfram, the tungstic acid will be completely set free, and remain in the residues with the oxide of tin, from which it can be removed by digesting a second time with caustic potash or ammonia.

3. THE REDUCTION.—The tin ore, freed from the iron and wolfram it contained, must now be reduced, in order to obtain the tin in a metallic button,—the accompanying ganguey minerals, and the remaining small proportion of oxide of iron, forming a slag.

Now, in order to obviate the usual but troublesome formation of numerous small globules of tin instead of one button, I have advantageously adopted the system of mixing with the tin ore a certain determined quantity of pure per-oxide of copper; so that by the reduction an alloy of tin and copper is formed, in which the proportion of the latter metal is accurately known. Copper, being easily reducible and not volatile, is specially adapted for this purpose; and if it be added in sufficient quantity, no trace of the numerous small globules will be found. To 1 assay standard (*Probircentner*) of tin ore the same quantity of per-oxide of copper may be added. Both are introduced into a crucible, and mixed by a piece of iron wire; and upon this mixture is poured from 2 to 3 assay standards (*Probircentner*) of flux, consisting of two parts of anhydrous carbonate of soda and one part of white flour, with about quarter of an assay standard (25 *Probirpfunde*) of borax glass, when the whole is covered with a thick layer of common salt, upon which is laid a large piece of charcoal. Upon this the crucible is closely covered and placed in a muffle, where it is heated for an hour—first at a red heat, and then at a low white heat. It need not be heated for a longer period, nor at a higher temperature.

When the crucible is broken, a bottle-green transparent slag is found, and at the bottom a large white brittle button of tin and copper. Small globules are never found near the large ones either in the slag or in the charcoal. I have not so far found it advisable to mix a portion of the flux with the ore, because from the ebullition at the commencement of the reduction grains of metal are easily thrown up and, adhering to the sides of the crucible, escape determination. From the weight of the button, which generally amounts to more than 1 assay standard (100 *Probirpfunde*), the copper must be subtracted. The 1 assay standard (*Probircentner* = 10,000 *Pfundtheile*) of per-oxide of copper added, supposing it to have been chemically pure, contains 7,982 *Pfundtheile* of metallic copper; assuming now the button of alloy obtained to weigh 12,597 *Pfundtheile* (1,2597 *Probircentner*), the quantity of tin-assay will be $12,597 - 7,982 = 4,615$ *Pfundtheile* = 46.15%.

As however a perfectly pure per-oxide of copper cannot always

be obtained, it being indeed rather difficult to produce, the commercial oxide of copper may be used with equally good results. In order to ascertain the proportion of metallic copper it contains, 1 assay standard (*Probircentner*) of it is reduced in the crucible with flux and borax, by which a completely fused button of copper is obtained, whose weight accurately shows the proportion of metal contained in the oxide—usually amounting to from 78·3% to 78·5%. This application of per-oxide of copper to the assaying of tin enables a much more accurate result to be arrived at than has hitherto been possible;—the weight of button obtained rarely differing more than from 30 to 50 *Pfundtheile* (·3% to ·5%) from the true produce.

It may possibly be urged against this process that the mixing of the copper with the tin-assay is objectionable, inasmuch as it would render it impossible to ascertain the quality of the tin obtained. To this I may reply that if, under the ordinary system, the sample be properly treated *before* being reduced, all those metals which deteriorate the quality of the tin are so completely got rid of that the same objection would apply there, and is therefore untenable as against my process in particular. The sulphur, arsenic, and antimony are almost, if not entirely, volatilised in the roasting with charcoal; and by digesting the roasted ore with hydrochloric acid, or by melting it with bi-sulphate of potash, the iron, manganese, copper, zinc, &c., pass into solution, leaving only the residues consisting mainly of oxide of tin mixed with silica, and in many cases tungstic acid, which, however, can be easily got rid of before reduction. The brittleness of the button of alloy obtained cannot cause any misconception, as it is well known that tin makes brittle alloys with most metals.

I have had no means of ascertaining whether the stanniferous slag can be assayed with the addition of per-oxide of copper. Still it is not improbable that in treating such slags with copper, tin and iron would be separated. The buttons obtained from one or more assay standards (*Probircentner*) of slag obtained must be pulverised in a steel mortar and then treated with nitric acid, by which means the copper and iron are dissolved, and oxide of tin (sometimes perhaps mixed with tungstic acid) remains in the residues. This acid can be extracted by ammonia, and the now pure oxide of tin be reduced with the addition of per-oxide of copper. A similar mode of proceeding becomes necessary if the ores assayed contain lead or bismuth as well as tin.

* * Pressure on our space compels us to postpone this month the commencement of Mr. Salmon's papers on "The Mines and Mining Operations of Cornwall."

Abstracts and Reviews.

PROFESSOR J. D. WHITNEY ON MINING.

On the 28th of January last, Professor J. D. Whitney, the well-known American Geologist, delivered a lecture at San Francisco, California, "On Mining, and Its Relations to Civilization and Progress."

As the demands on our space forbid our giving the lecture *in extenso*, we confine our extracts to those portions of it that refer to Mining on the American Continent; the information respecting which will be new, and we doubt not interesting, to most of our readers.

The general geographical and geological position of California is such as to lead to many interesting reflections. If there is any feature of the earth's surface to which with propriety the epithet *grand* can be applied, it is the crumpled border of the Pacific Ocean which forms the western slope of the North and South American Continent. This crumpled border, which has been formed by the gradual sinking of the bed of the Pacific, comprises a vast assemblage of mountain chains, which are a unity in many respects, and to which the collective name of the Cordilleras of North and South America, or the American Cordilleras, may be applied. Although the Himalaya may boast of higher mountain summits, taken as a whole, the American Cordilleras constitute by far the greatest assemblage of mountain ranges in the world. They may in fact be called its backbone.

Beginning at the southern end of the chain, with Tierra del Fuego, we pass north, successively, through the Patagonian, Chilean, Bolivian, Peruvian, and the Columbian Andes, which together constitute an unbroken wall along the Pacific shore for a distance of 4,500 miles in length, with a breadth of from 40 to 350 miles, and with a mean elevation of nearly 12,000 feet. In some places, the range consists of a single ridge; in others, of two or more, having lofty plateaux (like that of Quito) between them, with a steep and rugged slope to the Pacific, and a gradual decline eastward into the broad and fertile plains of the Orinoco, the Amazon, and the La Plata.

After sinking down on the Isthmus of Panama, so as to allow of an easy railroad communication across the chain, this great mountain system again rises rapidly towards the north and spreads out fan-like through Mexico, across the whole territory of the United States to the Arctic Ocean.

Within the limits of the United States the Cordilleras have spread themselves out to their greatest width, and in the latitude of San Francisco a line drawn across the chain from west to east will have its maximum length, which is just about a thousand miles; it being but a few miles less than that distance from this city in an air-line to Pike's Peak. The area occupied by this mountain network in our territory is about 1,000,000 square miles, an area almost five times as great as that of the whole empire of France.

This vast tangle of mountains is but just beginning to be explored. In former days geographers used to represent a single continuous ridge stretching across the middle of our territory from north to south, like a huge caterpillar, dividing the east from the west, and giving the impression that beyond was a vast plain to near the shores of the Pacific; but we now know that this whole space is occupied by range after range of mountains, with comparatively narrow valleys between them, which

probably altogether do not make up one-tenth part of the whole area; so that we have a stupendous labyrinth of ridges, enough to puzzle the geographers and geologists to unravel for the next hundred years. We are accustomed to call the eastern edge of this system of elevations the Rocky Mountains, and the western side the Sierra Nevada and Coast Ranges; but, unless we start with an artificial system arranged beforehand, we cannot say where the one leaves off and the other begins.

It is chiefly to one feature of the American Cordilleras that I wish to direct attention as especially connected with the subject of this lecture; this is the great prominent fact, that this complex of mountain ranges is pre-eminently the mineral storehouse of the globe. For the last three hundred years, a stream of metallic wealth, and especially of the precious metals, has been flowing steadily from various points in the Cordilleras of North and South America towards the eastern countries, compared with which the rivulets proceeding from European and Asiatic mining regions were, up to the time of the opening of the Australian gold fields, at least, almost as nothing. The history of the American Continent, for the first hundred years at least, is almost exclusively the history of adventurers in search of El Dorado, the land of gold. Lofly as may have been the motives of Columbus himself, the mainspring of the great geographical discoveries in the fifteenth and sixteenth centuries which revolutionized the whole trade, commerce, and political status of the world was the love of gold.

These treasures of gold and silver with which Europe was deluged agitated the civilized world to its deepest foundations. The populace went wild at once with a lust of gold and the love of adventure. In 1545 the mines of Potosi were hit on by a poor herdsman, and from the comparatively narrow area occupied by one isolated mountain at an elevation greater than that of the highest peak of the Sierra Nevada more than \$1,000,000,000 (200,000,000*l.*) have been obtained by the rudest processes and the most reckless working. The whole territory under Spanish dominion, including New Spain or Mexico, is believed to have produced, up to the beginning of the present century, between \$5,000,000,000 and \$6,000,000,000 (1,000,000,000*l.* and 1,200,000,000*l.* sterling). In the year 1571 the process of amalgamation was introduced; but most of the quicksilver used was brought from Spain, so that, in reality, there was but little mining anywhere under Spanish dominion, except for gold and silver. The ores of all the other metals have been long known to be more or less widely disseminated through the Cordilleras, but none of the less valuable ones were worked until quite recently.

It will be observed that the great deluge of the precious metals which inundated Europe did not, in any part, come from territory now belonging to the United States. It was not until nearly a century after the discovery of the Potosi mines that a few colonists set foot on the barren and emphatically non-metalliferous shores of New England. Mining formed no part of the object of these men; and, if it had, they could not have come to a worse region in which to carry it on. Through the whole of the early period of our national history mining remained the least attended to of all branches of industry. Indeed up to the commencement of the present century the amount of the metals raised, whether of those styled precious or any other, within our borders, had been so small as to be quite unworthy of notice.

As early as 1650 the Governor of Connecticut had initiated the prospecting business in this country, in the vicinity of Haddam and Middletown, on the Connecticut river; but the practical results were of no consequence. As far back as 1659 the Jesuit Fathers were labouring among the Indians on the shores of Lake Superior, and of course did not fail to notice the masses of native copper scattered over the country; but

it was almost two hundred years after the publication of their accounts of the occurrence of this metal, in that almost inaccessible region, before any mining operations were commenced which led to permanent results. But it is a most curious fact that long previous to any time of which there is a historic record, and, as it would appear from various circumstances, not less than a thousand years ago—and perhaps much more—the whole region of Lake Superior, and even the remote islands on the north shore of that lake, were mined over, in literally thousands of places; shafts being sunk in solid rock to the depth of over 50', without the aid of steel or gunpowder, and masses of copper raised of several tons in weight. I believe that there has never yet been discovered an important vein in that region, on which some work had not been done by these ancient miners, of whose origin and disappearance nothing is definitely known.

Early in the eighteenth century Le Sueur, a Frenchman, explored the valley of the Upper Mississippi. Like many other searchers after metals, he imagined that he had discovered mountains of metallic ores, and actually brought a cargo of what he supposed to be copper down to New Orleans; but, as there was really nothing of the kind in the region he explored, and as, if there had been, it could have been of no value in those days, his labours came to nought. Although we had no evidence of the fact, Le Sueur may have aided to blow up the prodigious bubble which the French originated some twenty years later, called the "Company of the West," and which was perhaps the most visionary of all the great humbugs ever started. It was based upon the presumed existence of the precious metals in the Mississippi Valley, a region rather more destitute of them than any other portion of the earth of equal size. The only metallic ore found in any considerable quantity by the miners and explorers sent out by this company was that of lead; but the few mines which had been started were abandoned when the bubble burst in Europe, as it soon did, with a terrible crash.

During the eighteenth century occasional efforts were made to work mines of copper, lead, or other metals throughout the region now occupied by the Atlantic States; but little was accomplished. Some iron was made in Virginia and Massachusetts, the first iron-furnace in the United States having been erected in the last-named State in 1702; but as long as we were colonies, Great Britain, in accordance with her then colonial policy, prevented the growth of this business, destined afterwards to become of such immense importance.

The lead mines of the Northwest, especially those of Missouri, began to be worked just at the close of the last century; but it may be safely asserted that, in the way of the development of our mineral resources, nothing of importance had been accomplished until about the beginning of the nineteenth century.

Within the last fifty or sixty years the United States has made prodigious strides towards the first position among nations as a producer and consumer of the metals; but the progress has been very irregular and spasmodic. Mining fevers have raged and have been succeeded, like all attacks of high mania, by periods of depression. We have run through successively the lead, the copper, the gold, and now are perhaps a little past the crisis of the silver excitement.

Lead mining began in the Upper Mississippi and Missouri lead regions early in the present century, and the mines reached their maximum productiveness in the years 1835 to 1845, during which period from 25,000 to 30,000 tons of the metal were produced annually.

In 1845 our mines produced about the same amount of lead as those of Spain; while England produced about as much as the United States and Spain together; these three countries together yielding fully nine-tenths of the whole produce of the world in this metal. Thus lead was

the first metal with which we began to make a figure in the commerce of the world; but, unfortunately, our mines, as well as those of Spain, are not founded on permanent veins, so that our produce has been falling off within the last few years, and England now produces about half the lead of the world, which is fully 150,000 tons.

In copper we did but little or nothing until the opening of the Lake Superior mines, where the first blow was struck in 1845, and which was the only cupriferous district of any importance in the United States, until California began to work her deposits of the ores of this metal.

In 1853 Cornwall and Chili together produced one-half of the copper consumed in the world, the grand total of the yield of that metal being about 56,000 tons. The other half was made up of small amounts from nearly every country in Europe, as well as from Cuba and Australia. During the last ten years the consumption of copper has been steadily increasing, and must now be fully 70,000 tons per annum; but in the case of this metal, more than any other, the grand total is made up of items from all parts of the civilized world, as its ores are, next to those of iron, most widely and universally distributed.

But there is another metal of much greater importance than either of those yet mentioned, and of which our production has been steadily increasing since the beginning of the present century; so that, at the time the Lake Superior region was opened, we stood only second to Great Britain in the amount furnished to commerce. I mean iron—which is emphatically the metal of civilization and the arts.

Of iron we produced in 1845 about 500,000 tons per annum, and now probably about 1,000,000, which is one-seventh of the product of the world at the present time. England, as usual, comes in for the lion's share—namely, one-half, or 4,000,000 tons; and when we add that this immense production of iron is accompanied by a correspondingly enormous yield of mineral coal, no less than 90,000,000 of tons per annum—we need not ask any further questions why England rules the sea, and a considerable portion of the dry land. It may be consoling to the pride of an American, however, to reflect that, according to the highest authority, namely that of the President of the British Association, as enunciated at its last September meeting, the best coal mines of Great Britain will be exhausted in less than two hundred years if they continue to be worked as they have been for the last few years; and as the area of our coal-fields is believed to be from twenty to forty times as great as that of Great Britain, those who can have the patience to wait a couple of hundred years will probably have the satisfaction of seeing some remarkable changes in trade and commerce in favour of our side of the Atlantic, especially as our stores of iron ore, laid away in the mountains in nearly every State of the Union, are ampler than any other known to exist in the world.

The great secret of England's unrivalled prosperity in manufactures and commerce lies in the proximity of the coal and the iron to each other, and the consequent cheapness with which both can be raised—often from the same pit; but our disadvantage is partly compensated by the superior quality of our ore, especially of that of Lake Superior and Missouri, where it exists in what may, without exaggeration, be called mountain masses.

A new epoch in the history of mining, not only of the United States but of the world, dates from the beginning of the gold excitement, which originated in California in 1848. I do not say from the "discovery" of gold in California; for although it is true that the finding of the precious metal at Coloma, on the South Fork of the American river, was the spark which flashed all over the world, yet it is not the less the fact that gold had been regularly obtained by washing, and even by quartz mining, as early as 1843.

It may seem strange that this should have been so; that years should

have rolled by without any attention having been called to these facts ; and that then suddenly all civilization should be so profoundly affected by a circumstance so nearly akin to those which had preceded without causing the slightest commotion.

Be this as it may, it is certain that the year 1848 marked the commencement of a new era in the history of mining throughout the world ; and discoveries spread in every direction, from California as a centre, over a large portion of the world. Of the effects on the commerce of the world, and the march of civilization, of the developments of mining resources which have been almost constantly taking place since 1848, it is hardly possible, in a few words, to convey any adequate idea. What silver was to the Spanish nation in the sixteenth century, gold has been to the Anglo-Saxon nationalities in the nineteenth. For, most strange to say, the great gold discoveries of the past fifteen years have, in vastly the greater proportion, been on the soil of the former or present colonies of Great Britain. First California, then New South Wales, then Victoria, then British Columbia, then New Zealand ; and lastly Nova Scotia has put in its claim as a gold producing country. The immense emigration from England consequent on these discoveries re-acted, most powerfully on the United States, for the raising of wages there enabled us to compete with that country in various branches of manufactures, which could not be done before.

It is a fact that extremely few metalliferous veins are equally rich for any considerable distance, either lengthwise or up and down ; the valuable portions of the ore are concentrated in bunches which are frequently very limited in extent, compared with the mass of the vein. Similarly, with regard to surface indications, it is not once in a hundred times that they lead to masses of ore beneath of sufficient extent to be worked with profit. There are, literally and truly, thousands of places in New England where ores of the metal, including silver, copper, tin, lead, zinc, cobalt, and nickel, have been observed ; many of these have given rise to mining excitements, and have been taken up, worked for a time, abandoned, taken up again, abandoned, again, off and on for the last fifty or even a hundred years, and always with partial, and usually with a total loss of the money invested. There may be one solitary mine in Vermont which is paying a small profit to the shareholders ; but with the exception of this, and a few mines of iron-ore on the border of Massachusetts and Connecticut, there is not one which has not cruelly burned the fingers of those who have meddled with them. Even on Lake Superior, that region which is commonly appealed to as made up of solid copper, there have been many hundreds of companies formed, and at least a hundred mines opened and worked more or less extensively ; but for ten years after mining had begun to be actively carried on there, only two of the mines had paid to the stockholders one cent of dividend. Even in England mining for the metallic minerals, with the exception of iron, is not on the whole remunerative. There appears to be a wonderful fascination about mining which seems to blind the eyes and bewilder the senses of those who come within the sphere of its influence.

By a singular coincidence, it has happened that two great offshoots of the English stock have been planted nearly at the same time, and under closely resembling circumstances. In geographical position, they are the very antipodes of each other ; but in all else wonderfully alike. I refer of course to the region of the Pacific slope of the United States and the English colonies in Australia, especially that of Victoria. California had three years the start of Victoria ; and it was through the discoveries of a returned Californian miner that the gold deposits of the latter region were opened to the world.

In the amount of their production of the precious metal, which is the

great staple commodity of both countries, there is no very great difference; but, although it may not be very pleasing to our State pride to have to confess it, there is pretty good reason to believe that our cousins at the Antipodes have outstripped us in all that relates to the development of their resources and the substantial improvement of the country.

Melbourne, which is the San Francisco of the antipodal gold regions, is twice the size of our metropolis. She has 350 miles of railroad leading out into the country, which have cost \$175,000 a mile to build. The Victorian gold-fields are said to be models of industry, order, and sobriety. There are several interior towns, having a population of from 20,000 to 30,000, and well built of stone and brick, with public buildings, both substantial and elegant. The town of Ballarat, for instance, has 5,000 stone, brick, and wooden houses, nine banks, all handsome stone buildings, a large and elegant hospital, a mechanics' institute and reading room, a court-house, town-hall, three theatres, and two daily newspapers. Where is the interior mining town on this coast of which as much can be said?

Certainly there is no reason to believe, as far as one can judge from published documents, that Australia is superior to California in natural advantages. Our mineral deposits seem even to be more varied and extensive than theirs, and our agricultural capacity fully as great; indeed in many respects there is a striking resemblance between the two countries in climate and other circumstances which determine the nature and amount of the produce of the soil.

In casting about to find out what could be the cause of the greater advance of the colony of Victoria, I could find no reason which seemed so likely to be the true one as the pains taken by the Government on all questions connected with the security and welfare of the miner, and the admirable regulations which have been established in connection with the disposal of the Government mineral lands, and for the settlement of conflicting claims among the miners; and a thorough geological survey has been going on there for the past ten years. There are undoubtedly several points on which we might receive instruction from the experience of our antipodal cousins, if we could once make up our minds that we did not know every thing already.

Placer mining had been prosecuted pretty steadily in California, with the exception of occasional furious rushes of a portion of the population of the State to supposed new districts—as to Fraser river, for instance, in 1858; and auriferous quartz mining had made some progress towards stability at the beginning of the year 1859. But with the exception of the quicksilver mine at New Almaden nothing had up to that time been done towards developing the other metalliferous deposits supposed to exist in the State, of which little however was definitely known. In that year the discovery of the Comstock lode gave a new impetus to mining on the Pacific coast, and formed indeed an era in the mining history of the whole country.

Here, in San Francisco, it is needless to speak of the excitement which followed the Washoe discovery, for we are in the midst of it now; but only those who have been in it can realize the rapidity and recklessness with which, one after the other, new mining regions were opened on the other side of the Sierra, and how the State of California seemed almost about to be drained to the last man and deprived of its mining machinery by the rush over the mountains.

These great discoveries which have so agitated California and the adjacent territories during the last three years are on the same great metalliferous belt of which I have before spoken as extending from the extreme southern end of South America to the Arctic Sea. For 300 years the Spanish-American race has had the opportunity of showing what it could do with the immense resources placed at its disposal in the mountain

chains of Chili, Peru, Bolivia, New Grenada, Central America, and Mexico. In Peru, as the net result of the winning of hundreds of millions of treasure, nothing can be shown but a region not half worked out, but so devastated and ruined by reckless mining as to be almost rendered for ever worthless. Mexico is not much better, for even the introduction of English capital during the past thirty or forty years has done little to raise that country. What will be the future of the immense mining region comprised within the limits of the United States, which the explorations of the past three or four years have shown to exist, is a question pregnant with interest. That the wealth of the world will be added to immensely by the mining operations, which can be hardly yet said to have begun in the vast territory comprised between the Rocky Mountains and the Pacific, cannot be doubted.

The Government of the United States has always been singularly unfortunate when it has attempted to meddle with mining matters; and becomes positively ludicrous when it touches on Mining Statistics. To illustrate this I need only to refer to the last census, to see what confusion is made with the whole subject of mining statistics. In what professes to be a tabular statement of the yield of the mines in the United States, the number of tons of ore raised is given, although really without any approach to accuracy; but the worst feature of the table is that no clue is furnished to the percentage of metal contained in the ore. Worse than this, the superintendent of the census indulges in considerable glorification in regard to the number of pounds of iron produced in the United States, as related to the number of the population. By his figures he makes out that 92 lbs. of iron are produced for each inhabitant. This result he obtains by adding the amount of pig-iron produced to that of bar and rolled iron, not knowing that the first is the raw material from which other is made. But this is only one specimen of Washington wisdom as applied to mining matters. The Commissioner of the General Land Office, in his last year's report to the Secretary of the Interior, takes up the subject of the mineral lands of the United States, and, in order to show that California ought to be only too happy to pay those little war bills which are running up at the rate of a thousand millions or so per annum, he makes certain statements with regard to the richness and extent of the deposits of the precious and other metals in the United States, in comparison with which the travels of Munchausen appear to be sober and prosaic history. He appears to conceive that solid gold and silver constitute the basis on which the Cordilleras of North America are built up; for, if his figures are correct (and he gives figures), we should produce in one year about six times as much as the whole yield of the American Continent from its discovery up to the present time, or say the round sum of \$30,000,000,000 (6,000,000,000*l.* sterling) per annum; and this before getting into the productive ground, which we shall strike "*when a sufficient depth shall have been reached!*"

Congress has, at various times, tried very hard to dispose of the vexed question of how to get a revenue out of the mineral lands of the United States. In the lead region of Wisconsin, and the copper lands of Lake Superior, the system of leasing was tried, and in each case proved a signal failure. When the Lake Superior region was first opened, the mineral lands were leased out in tracts three miles square, under authority of the War Department. The absurdity of this arrangement, under which a few political characters might soon have obtained possession of the whole region, was soon discovered; and Congress finally ordered the lands to be sold, exactly the same thing having been previously done with the lead-bearing country in the Upper Mississippi Valley.

While every one will admit that the present condition of title to mineral claims in California and the adjacent Territories is a terrible drawback to

the prosperity of the Pacific coast—and while there are many indications that something will be done in the matter before long—there is great reason to fear that the Government may be led to taking some steps which will inflict a greater injury upon us than even our present condition does. It seems to me that the establishment of a joint commission, on the part of the State and the United States, to investigate the question of the disposal of the mineral lands, or of lands in the mineral region, would be the best method of shedding light on this exceedingly difficult question, and preparing the way for future action. The subject should be studied in all its bearings, and a plan proposed, embodying the results of a full legal and scientific investigation of the question, which should be urged upon Congress for adoption. There is little doubt that, by this course, a long stride might be made towards that condition of stability which California and the adjacent Territories so much need.

TREATMENT OF COPPER ORES IN CARNIOLA.*

The ores treated in Carniola are generally sulphides, principally variegated pyrites; but they also contain a little malachite. They are not "dressed," or treated mechanically, as this is found to afford no advantage in their metallurgical treatment. Their produce of copper varies from 2 to 2½%.

The treatment comprises the four following operations:—

1. The roasting of the stamped ore, mixed with pyrites, which is charged to the furnaces in the form of bricks;
2. The lixiviation of the sulphates formed;
3. The precipitation of the copper by iron; and
4. The extraction of the sulphate of iron from the mother liquor after the copper has been separated.

The products obtained are:—Copper cement; crystallised sulphate of copper; and oxide of iron, as an accessory product.

The copper ores and pyrites are stamped in an ordinary stamps of 20 heads, with a continuous current of water.

The copper ore and pyrites are mixed in such proportions as experience shows to be most advisable, in an apparatus similar to that used for mixing refractory clays. The bricks, each weighing about 1½ lb., are made by hand. They are dried for twelve hours in a kiln which holds about 6,500.

The ores are roasted in furnaces from 3' to 5' in diameter, and from 9' to 12' high. The operation may be either continuous or intermittent. When it is carried on intermittently, the bricks are covered at the throat by a layer of moist ore, in which several openings are arranged: for the first two or three hours only a moderate temperature is kept up, but this is afterwards gradually raised during the roasting, which lasts from twenty-four to thirty hours. When the operation is continuous, the bricks usually remain uncovered at the throat; the roasted products being withdrawn at the bottom, and fresh bricks charged at the top. A continuous roasting in the same furnace may be carried on for four weeks; and there seems to be no difference in cost between this and the intermittent system. When the bricks are sufficiently roasted, they are of a pale red colour, purplish towards the angles.

The lixiviation is carried out continuously in wooden vats, each capable of containing 80 quintals of ore and the necessary water. Six of these are arranged in tiers, and are provided with stirrers and pumps so that the poor lye passes over ores less and less impoverished, while the clean water comes on the ores already treated. By this means a rich lye is obtained, showing from 10° to 12° Reaumur (54° to 59° Fahr.). The oxide of iron is

* From the *Oesterreichische Hüttenmännische Zeitung*.

separated by settling and decantation, and is collected and dried as an accessory product.

The copper cement is now precipitated by iron in wooden vats, hermetically closed, which are made to revolve on their axis by machinery worked by a water wheel. The iron is in small fragments; and the bung of the vat is opened from time to time to allow of the escape of the gases formed. This system of precipitation has the advantage over that in general use, in yielding a rich precipitate of copper of a produce of from 75% to 78%, in requiring only a relatively small quantity of iron, and in precipitating the copper more rapidly. The solution of sulphate of iron is evaporated and left to crystallise as in the ordinary methods of treating copper by the wet way.

The cost of the stamping, mixing, drying, roasting, lixiviation, and cementation amounts to 10 Austrian kreutzers (4½d.) per cwt. of bricks. The consumption of wood, per 100 cwts. of bricks, is '33 Vienna klafter* (40 cubic feet) for the drying, and '056 klafter (6½ cubic feet) for the roasting.

AMERICAN STAMPS.

The mechanical preparation of ores has entered upon quite a new era within the last few years. After having long regarded as classic the systems used in the old mining districts of Europe, it seems lately to have struck people that the details of these apparatus might be usefully modified according to the nature of the ores and of the gangues, and the quantity of water available. Indeed it is difficult to understand how so many engineers can for so long have been satisfied with remaining stationary; but we may now hope to see greater progress in this important branch of mineral industry.

As we might have expected from the inventive genius of the Americans, they have been the first to abandon copying servilely the old types. In M. Borie's memoir on the copper mines of Lake Superior, in the *Bulletin de la Société de l'Industrie Minérale*, we have several notices of improvements in this direction, one of which, with respect to stamps, we consider worth notice.

Recently, since the discovery of lodes containing copper highly disseminated, considerable attention has been given in this district to the question of stamping—for these lodes can only be made available by a very careful system of dressing. Up to 1856 the stamps employed did not differ materially from the Cornish type, with wooden lifters, each head weighing from 4 cwts. to 5 cwts. and falling from 6" to 8".

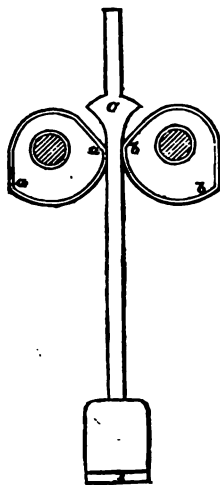
Iron lifters were subsequently adopted; and recently Mr. Hodge, of Detroit, has introduced the improvement we are about to describe. Instead of lifting the heads to a constant height above the bottom of the cover, and consequently allowing it to fall upon the ore from variable heights according to the quantity accumulated in the cover, they are lifted from variable heights so arranged as constantly to have the same fall on the ore. To obtain this result, Mr. Hodge substitutes for the ordinary cam two wheels (see Fig. 14) which, catching the lifter between them, lift it a height equal to the length of the arcs *aa*, *bb*. To insure these wheels catching the lifter, the latter is provided with the double projection *c*, the two lateral curves of which are arcs of the same radius as *aa*, *bb*. It will be at once evident that these wheels catch the lifters at variable points according to the quantity of ore in the covers, but raise them always an equal height.

In order to avoid the inconvenience of the loss of weight resulting from

*The Austrian klafter is about 6½' high, 6½' wide, and a little more than 3' long.

the wearing of the stamps-head, and the consequent irregularity in the catching of the lifter by the wheels, Mr. Hodge supplies the head with the thick cast-iron shoes, which can be readily replaced as worn.

FIG. 14.



Each head weighs about 14 cwt., and is lifted 2' 3". Eight of these heads stamp from 78 to 80 tons of ore of average hardness, which, according to M. Borie, would have required 65 to 70 heads on the old system. These new stamps have certainly the inconvenience of causing great vibration, and being rather destructive to the foundations, as well as causing a great wear and tear of the stamps and stamps-bottoms; but, on the other hand, they occupy much less space, and get through an immensely increased quantity of stuff.

Since 1861 Mr. Hodge has also improved the stamps-grates, the holes in which are more numerous and better arranged than formerly. This has been found to improve the returns considerably, for when the grain of the ore has been brought down to the required size, the sooner it is removed the better, as if it remains under the stamps, it not only impedes the working, but becomes pulverised to a state of slime which is always objectionable. With grates of the same area, the ratio of the quantity of stuff passed by the new ones compared with the old is as 13 to 9.

In the Lake Superior region there is also another system of stamping in operation, invented by Mr. Ball. His stamp is in fact a regular forge-hammer, differing only from those used in foundries by turning a little each stroke so as to equalise the wearing of the shoe, which weighs from 23 cwt. to 25 cwt. To lessen the vibration caused by the blow from such a mass, the cover has supports of vulcanised india-rubber, which to a certain extent deadens the destructive effect of the shock. A set of these stamps is composed of two heads only, which reduce from 140 to 150 tons of ore per twenty-four hours. The fuel can be regulated according to the hardness of the ore to be stamped.

PROFESSOR HAUGHTON ON JOINTS.

At the meeting of the Royal Society on February 25th, an abstract was read of a paper by the Rev. Professor Haughton, M.D., F.R.S., "On the Joint Systems of Ireland and Cornwall, and their Mechanical Origin." The following is the abstract of the paper given in the *Proceedings of the Royal Society*. It affords, however, such a meagre and imperfect notion of its scope that it is impossible for us to offer any opinion on it at present; but we hope to do so when the paper appears *in extenso* in the *Philosophical Transactions*, for the subject is one bearing directly on many important points of economic geology.

This paper is a continuation of a former paper "On the Joints of the Old Red Sandstone of the Co. Waterford," published in the *Philosophical Transactions* for 1858, and contains the results of the author's observations for some years in Donegal, the Mourne and Newry Mountains, Cornwall, and Fermanagh, with deductions from theory.

The author establishes the existence in Waterford of a Primary Conjugate System of Joints, and of two Secondary Conjugate Systems, lying at each side of the Primary at angles of 27° 5' and 37° 11'.

In Donegal there exists a Primary Conjugate System, and a Secondary System, making with the Primary an angle of $32^{\circ} 24'$. In the Mourne and Newry Mountains there is a Primary Conjugate System, and two Secondary Systems at each side of the Primary, making angles of $31^{\circ} 46'$ and $30^{\circ} 56'$. In Cornwall there is a Primary and also a Secondary Conjugate System, making an angle of $27^{\circ} 28'$. And in Fermanagh there are Primary and Secondary Systems, forming an angle of $31^{\circ} 1'$.

Having given, in detail, the observations on which the preceding results are founded, the author says :—"Collecting together into one table the results of the preceding observations, we find the following Table of Primary and Secondary Joints (True Bearings) :—

Name.	Waterford.	Donegal.	Mourne.	Cornwall.	Fermanagh.
Primary System (A) .. {	N. of E. $32^{\circ} 26'$	N. of E. $26^{\circ} 16'$	N. of E. $39^{\circ} 40'$	N. of E. $32^{\circ} 34'$	N. of E. $21^{\circ} 30'$
Primary Conjugate (C) .. {	W. of N. $31^{\circ} 37'$	W. of N. $29^{\circ} 35'$	W. of N. $38^{\circ} 31'$	W. of N. $32^{\circ} 55'$	W. of N. $25^{\circ} 48'$
First Secondary (A') .. {	N. of E. $58^{\circ} 11'$	N. of E. $58^{\circ} 40'$	N. of E. $70^{\circ} 40'$	—	N. of E. $54^{\circ} 0'$
Conjugate to First Secondary (C') {	W. of N. $60^{\circ} 3'$	—	W. of N. $70^{\circ} 40'$	—	W. of N. $55^{\circ} 20'$
Second Secondary (A'') .. {	S. of E. $5^{\circ} 50'$	—	—	N. of E. $4^{\circ} 0'$	—
Conjugate to Second Secondary (C'') {	E. of N. $4^{\circ} 30'$	—	W. of N. $7^{\circ} 35'$	W. of N. $6^{\circ} 30'$	—

The only remarkable agreement as to direction of joints disclosed by the preceding table is that between Waterford and Cornwall. If we compare together the Primary and Secondary Joints in each locality, we find the following Table of Angles between Primary and Secondary Joints :—

	Waterford.	Donegal.	Mourne.	Cornwall.	Fermanagh.
Between Primary (A,C) and First Secondary (A',C') {	$+27^{\circ} 5'$	$+32^{\circ} 24'$	$+31^{\circ} 46'$	—	$+31^{\circ} 1'$
Between Primary (A,C) and Second Secondary (A'',C'') {	$-37^{\circ} 11'$	—	$-30^{\circ} 56'$	$-27^{\circ} 28'$	—

This table discloses a very interesting and unexpected result ; viz., that in Waterford, Donegal, Mourne, and Fermanagh, the angle between the Primary and first Secondary Joint-Systems ranges between the narrow limits of $27^{\circ} 5'$ and $32^{\circ} 24'$, and that in Waterford, Mourne, and Cornwall, the angle between the Primary and second Secondary Joint-Systems ranges from $27^{\circ} 28'$ to $37^{\circ} 11'$.

The paper concludes with a brief deduction of the observed laws of Conjugate and Secondary Joints from known mechanical principles.

WELSH AND NORTH COUNTRY STEAM-COALS.

The following is an abstract of the official report of the results of the trials of Welsh and North Country steam-coals singly and in combinations. The experiments commenced at Devonport on the 11th of July last, and were completed on the 19th of November.

The first five experiments were made on board the *Confiance* steam tug, where three tons of coals were burnt in each; but the rate of evaporation by the fuel could not be ascertained, as there were no means of measuring the quantities of water entering the boiler. The results of these experiments showed the mean pressure upon the piston, the mean number of revolutions of the engines per minute, and the indicated horsepower, to be nearly equal, and that the speed of the ship by patent log varied only to a slight degree in each of the experiments. The coal used was *Resolven* for Welsh and *Hartley Main* for North Country, and were burnt in ordinary fire-grates, but with perforated furnace doors, similar to that shown on the tracing accompanying this report.

The next fifteen experiments were made in the coal-testing boiler of *Keyham* factory, where quantities averaging about 12 cwts. to each experiment were burnt singly and in combinations. The coals used were *Wayne's Merthyr*, *Resolven*, *Merthyr Dare*, and *Gellia Cadoxton*, for Welsh, and *Hartley Main* for North Country, selected as of about the same age from the colliery. The first fourteen experiments were made with the common fire doors, and the last one with perforated fire doors.

But during the time the foregoing fifteen experiments were in progress, and towards the latter part of them, the Association of the South Wales Coal Owners took objection to the descriptions of coal under course of trial, from these descriptions of coal not being such as were raised from the collieries belonging to the Association, and obtained the permission of their lordships to send a cargo from their collieries; and in due course a cargo was received, composed of a combination, in equal quantities, of *Powell's Duffryn*, *Nixon's Navigation*, and *Davis's* upper four feet *Merthyr*.

The North Country Coal Association, finding what was granted to the Association of South Wales, and objecting in like manner to the quality of North Country coal under course of trial, as not being of sufficiently good quality to be samples from their district, and to test against the superior coals about to be supplied from Wales, made certain representations, which caused the Storekeeper-General of the Navy to order an especial cargo of North Country coal through Mr. Wood, the contractor; but as the North Country Association were not satisfied with this arrangement, they obtained permission to send a cargo of their own.

The cargo received from Mr. Wood proved to be *Hastings' Hartley*, and that from the North Coal Association to be *Davidson's Hartley*, both of which cargoes, together with that received from the South Wales Coal Association, were submitted to the next twenty-eight experimental trials, by samples singly for each description and in combinations, and burnt in the furnaces of the same boiler, under similar circumstances, and with similar average quantities of about 12 cwts. for each experiment. Part of these experiments were made with the furnaces fitted with the common doors, and partly with the furnaces fitted with the perforated doors. Some of the experiments were made with half-inch spaces between the iron bars, and some with five-eighth, three-quarter, and seven-eighth inch spaces.

One experiment was made at the suggestion of Mr. Tomlinson, the representative of the South Wales Coal Association, for the purpose of ascertaining the greatest evaporating power of Welsh coal when burnt in furnaces having three-quarter inch spaces between the bars; and the two experiments at the suggestion of Dr. Richardson and Mr. Bunning, the

representatives of the North Country Coal Association, for the same purpose, when North Country coals were burnt in furnaces with five-eighth and seven-eighth inch spaces between the bars.

The two representatives of the North Country Association also requested experiments to be made to ascertain whether a shorter furnace, with a reduced area of grate, would not produce better results than those obtained in any of the former experiments; and with this view the furnaces were shortened 1' in length, and the area of grate surface reduced from 14' to 10½'. Some of these experiments were made with the common doors, and some with the perforated doors, and the coals burnt were samples from the cargoes sent by the South Wales Association, Mr. Wood, and the North Country Association.

The experiments carried out on board the *Confiance* show that a combination of Welsh coal of ordinary quality and North Country coal of ordinary quality, in equal proportions, can be burnt with the perforated doors almost without smoke, with a nearly equal evaporative power to Welsh coal of ordinary quality.

The experiments carried out in the coal-testing boiler of Keyham factory show that the Welsh steam coals shipped from the ports of Swansea and Cardiff, and supplied under existing contracts, give very good evaporative results when burnt alone, and when burnt in combination with ordinary North Country steam coals; but it is to be observed that these experiments were made in furnaces fitted with the common doors, which would have been increased had similar experiments been made in furnaces fitted with the perforated doors. It was intended to have continued these experiments with the perforated doors, but they were broken off when the representatives of the two coal associations objected to the quality and description of coal under experiment. The averages for evaporation of the four kinds of Welsh coal when burnt alone are 9·34 lbs. of water per lb. of coal, and 144·44 lbs. per hour per foot of fire-grate. The average for Hartley Main was 8·26 lbs. of water per lb. of coal, and 153·50 lbs. per hour per foot of fire-grate when burnt under similar circumstances; while the combinations in equal proportions, and burnt under similar circumstances, give an average of 8·79 lbs. of water per lb. of coal, and 135·91 lbs. per hour per foot of fire-grate.

The experiments carried out in the same boiler, with samples from the cargoes of coals sent by the two associations, and that ordered by the Storekeeper-General of the Navy, show that these superior coals, when burnt respectively in furnaces fitted with the common doors, the average evaporative powers for Welsh coal are 9·90 lbs. of water per lb. of coal, and 165·34 lbs. per hour per foot of fire-grate; for North Country coal, 8·41 lbs. of water per lb. of coal, and 153·87 lbs. per hour per foot of fire-grate; and for the combination of the two descriptions in equal proportions, 9·42 lbs. of water per lb. of coal, and 153·16 lbs. per hour per foot of fire-grate, which is but slightly exceeded in any respect by either of the other combinations; and when these descriptions of coal were burnt respectively under similar circumstances, in furnaces fitted with the perforated doors, the averages are, for Welsh coal, 9·73 lbs. of water per lb. of coal, and 145·52 lbs. per hour per foot of fire-grate; for North Country coal, 8·61 lbs. of water per lb. of coal, and 146·89 lbs. per hour per foot of fire-grate; and for the combination of the two descriptions in equal proportions, 9·45 lbs. of water per lb. of coal, and 165·07 lbs. per hour per foot of fire-grate, which is only exceeded in the case of the produce of the Welsh coal per lb. of coal, while it is nearly equal in the quantity of water evaporated per hour per foot of fire-grate.

The experiments made after the furnaces of the boiler were shortened with the common doors show the evaporative powers to be, for Welsh coal, 10·13 lbs. of water per lb. of coal, and 227·60 lbs. per hour per foot of fire-

grate; for Welsh small, or dust and North Country coal in equal proportions, 9.91 lbs. of water per lb. of coal, and 213.94 lbs. per hour per foot of fire-grate; and for Welsh small, but of a larger description than the dust, and North Country coals in equal proportions, 9.54 lbs. of water per lb. of coal, and 218.07 lbs. per hour per foot of fire-grate; and the experiments when made with the perforated doors for Welsh coal, 10.44 lbs. of water per lb. of coal, and 233.53 lbs. per hour per foot of fire-grate; and for North Country coal, 10.23 lbs. per lb. of coal, and 249.37 lbs. per hour per foot of fire-grate. These experiments show that with a length of furnace more under the command of the stoker, and with an area of grate surface more in proportion to the heat-absorbing surface of the boiler, better results may be obtained than with a boiler otherwise proportioned.

The experiments made on and between the 28th of September and the 29th of October last, to which the most reliance is to be placed, from the description of coal burnt being each new wrought and of the best quality, show that while the Welsh coal when burnt in furnaces fitted with the common doors, which appeared to be best suited for this description of coal, evaporated an average of 9.90 lbs. of water per lb. of coal, and 165.34 lbs. per hour per foot of fire-grate, with an average equivalent for smoke of 30, the combination of equal proportions of Welsh and North Country coals when burnt in furnaces fitted with the perforated doors, which in like manner appeared to be the best adapted for this combination, evaporated an average of 9.45 lbs. of water per lb. of coal, and 165.07 per hour per foot of fire-grate, with an average equivalent for smoke of 14.5. The equivalent for smoke here referred to was arrived at by determining a certain number of marks, for certain degrees of density and colour in the smoke, namely:—

Very light smoke ..	..	..	..	= 1 mark.
Light ..	..	..	..	= 2 "
Light brown ..	..	..	..	= 3 "
Brown ..	..	..	..	= 4 "
Black ..	..	..	..	= 5 "
Very black..	..	..	..	= 6 "

which was recorded for every minute the smoke continued after each stoking, when the duration exceeded one minute.

The experiments made on and between the 4th and 19th of November last, with the shorter furnaces fitted with the common doors, and having a reduced area of grate surface, by which a greater amount of heat-absorbing surface was given to the boiler in proportion to the area of grate surface, show that while the Welsh coal evaporated 10.13 lbs. of water per lb. of coal, and 227.60 lbs. per hour per foot of fire-grate, with an equivalent for smoke of 12, a combination in equal proportions of Welsh small or dust and ordinary sized North Country coal, evaporated 9.91 lbs. of water per lb. of coal, and 213.94 lbs. per hour per foot of fire-grate, with an equivalent for smoke of 10: and a combination in equal proportions of what is termed Welsh beans or small coal of a larger size than dust and ordinary sized North Country coal evaporated 9.54 lbs. of water per lb. of coal, and 218.07 lbs. per hour per foot of fire grate, with an equivalent for smoke of 11. These experiments also show that when the perforated doors were fitted to these shortened furnaces, the evaporative power of the Welsh coal was raised to 10.44 lbs. of water per lb. of coal, and 203.53 lbs. per hour per foot of fire-grate, with an equivalent for smoke of 13; and that of North Country coal to an average of 10.23 lbs. of water per lb. of coal, and 249.37 lbs. per hour per foot of fire-grate, with an average equivalent for smoke of 25. And these experiments with the short fire-grates also comparatively show that it is possible to burn the Welsh coal dust, which otherwise is almost useless on board ship, and which in

many instances goes overboard as ashes, when mixed with North Country coal.

The whole of the experiments carried out in the coal-testing boiler of the factory show, firstly, that the economic value, or what is the same thing, the lbs. of water evaporated by 1 lb. of coal when burnt in the ordinary way with the common doors, was, for the Welsh coal obtained from store, 9·34 lbs., with the average equivalent for smoke of 70; for the Welsh coal received from the South Wales Coal Association, 9·90 lbs., with the average equivalent for smoke of 30; and for the same coal when burnt on the short furnaces, 10·13 lbs., with the average equivalent for smoke of 12; while it was for the North Country coal obtained from the store 8·26 lbs., with the average equivalent for smoke of 278, and for the North Country coal received from the North Country Coal Association, 8·41 lbs., with the average equivalent for smoke of 202.

Secondly. That with the perforated doors it was for the Welsh coal received from the South Wales Coal Association 9·73 lbs., with the average equivalent for smoke of 18, and with the same coal burnt in the short furnaces, 10·44 lbs., with the average equivalent for smoke of 13; while it was for the North Country coal from the North Country Coal Association 8·61 lbs., with the average equivalent for smoke of 34, and for the same coal when burnt in the short furnaces, 10·23 lbs., with the average equivalent for smoke of 25.

Thirdly. That it was with the common doors for the combinations in equal proportions of Welsh and North Country coals obtained from store 8·79 lbs., with the average equivalent for smoke of 47; for the combination in equal proportions of Welsh and North Country coal received from the two associations, 9·42 lbs., with the average equivalent for smoke of 23; and for the combinations of the Welsh small and ordinary North Country coals in equal proportions received from the same source and burnt in the short furnaces, respectively 9·91 lbs. and 9·54 lbs., with the equivalents for smoke of 10 and 11.

Fourthly. That with the perforated doors it was for the combination of Welsh and North Country coals in equal proportions received from the two associations 9·45 lbs., with the average equivalent for smoke of 14½.

And, therefore, it is remarkably to be observed that the combinations in equal proportions of Welsh and North Country Coals, while they produce on the average nearly equal economic results, they produce on the average greater rapidity in evaporation; that is, they on the average evaporate a given quantity of water by a given quantity of coal in a less time, and that they on the average produce the least amount of smoke.

From the experiments it is evident that the introduction of North Country coals, to be burnt in combination with Welsh coals in equal proportions, would be attended with desirable results, both as to a means by which all the Welsh coals put on board a ship might be usefully and economically burnt, as a means by which smoke may be prevented to a great extent, and ~~as a means by which~~ a more rapid evaporation might be effected, which if effected must render the steam boilers of all ships more powerful than they now are.

It is also to be stated that there would be no difficulty in coaling a ship with the two descriptions of coal; for the bunkers of one side of her might be filled with North Country coal, and those of the other side with Welsh coal, and then when required to be used in the stokehole, equal quantities could be taken from each side of the ship at the same time and mixed for use at the same furnace mouth. In all the coal store hulks half the stowage could be filled with one description of coal, and the other half with the other description; and in bags kept filled ready to be used, one-half the number could be filled in like manner with one description, and the other half with the other description; and then, when a ship was to

be coaled, nothing would have to be done but to put them on board; or if a ship was to be coaled from colliers, it would only be necessary to take one or more North Country colliers on one side, and one or more South Wales colliers on the other side. Or if there should only be colliers from Wales or from the North Country in port, it would only be to put one or more from either port on one side of the ship, and coal the other from store with the opposite description, as the case may be.

Extracts, Notes, and Memoranda.

ELECTRICAL SIGNALS FOR MINES.—The use of electricity for mining purposes seems to be fast extending. In our next number we shall describe a new apparatus for the lighting of mines, and for blasting, by electricity; and a recent number of the *Zeitschrift für das Berg-, Hütten- und Salinenwesen in dem Preussischen Staate* describes the application of electricity to underground signalling in the Von der Heydt Colliery, near Saarbrücken. In this mine the underground transit is effected by horizontal ropes worked by a fixed engine at the bottom of the Krug von Nidda shaft. The signals necessary for working this regularly were formerly transmitted by the ordinary mode of a knocker-line working levers; by which the signals were passed from station to station—about 100 fathoms apart—for a length of upwards of 1,000 fathoms from the working to the shaft. This system was, however, found for many reasons to be unsatisfactory, for mistakes were constantly made in the transmission of signals from station to station, as well as loss of time incurred. To remedy these inconveniences, a system of electric signals has now been adopted, by which a signal can be made from any point directly to the shaft. We may, on a future occasion, give drawings of this apparatus. At present we need only say that its entire cost, including fixing and every expense for the 1,000 fms., has been 879 thl. 27 sgr. (about 130*l.*). As, under the old system, the cost of attendance at each of the 10 intermediate stations—which is now dispensed with—amounts to 1,035 thl. a-year (about 155*l.*), it thus appears that, excluding the item of maintenance and repairs, which is not much more considerable than under the old system, the cost of replacing the old arrangement by the new electric apparatus will be recompensed in about 10 months.

NEW METHOD OF REDUCING IRON ORES.—Mr. William Henderson has patented improvements in treating ores, and other substances containing iron, in the manufacture of iron, steel, and alloys of iron. The ores contemplated to be treated are principally the purer ores, such as hematites and the better qualities of calcined black-band ores, and the residual oxides of iron obtained from iron or copper pyrites. These are pulverised with a proportion of coal or other carbonaceous matter varying according to the quantity of iron required to be produced and the metals to be alloyed with the iron; and to this fluxes—such as lime, common salt, &c.—are added and the whole is moulded into balls or lumps, which when dried are placed in retorts to be reduced to the metallic state. When it is intended to make wrought iron from the reduced balls, a sufficient quantity of coal or other carbonaceous matter is mixed to convert the whole of the oxygen contained in the ores into carbonic oxide. When it is required to obtain steel, as much oxide or carbonate of manganese is mixed with the crushed ores as will suffice to produce a metal containing

from 5% to 8% of metallic manganese. Titanium iron ore or chromate of iron may also be advantageously used, when sufficient carbon is added to produce steel. The balls are amalgamated, dried, and reduced in the retort; after which they are rapidly melted and puddled for a short time, and then run into moulds.—By this process it is easy to obtain any desired alloy of cast iron with metallic manganese, titanium, chromium, or carbides of these or any other metals.

THE NEW ZEOLITE MORDENITE.—In the Journal of the Chemical Society for March, Professor How, of King's College, Windsor, N. S., describes what he considers to be a new zeolitic mineral from the trap of Nova Scotia, and which he calls mordenite. It occurs in rather small masses, in the form of somewhat cylindrical, reniform, or flattened geodes and solid concretions, rather smooth externally, sometimes coated with a thin yellowish crust, blotched with a green mineral (probably a silicate of iron), and sometimes exposing its own white-yellowish or pinkish-coloured surface. Its interior often at first sight presents scarcely any appearance of crystalline structure, but on close examination a fibrous structure is seen, which in some cases is so distinct that the mineral has probably been considered a compact variety of "thomsonite." It has a highly silky lustre, weathering dull; it cleaves readily in directions parallel with the fibres, and is translucent on the edges. Its hardness is a little above 5; it is rather brittle, and its specific gravity is 2.08. Its mean chemical composition is as follows: soda, 2.35; lime, 3.46; alumina, 12.77; silica, 68.40; water, 13.02 = 100.00. On comparing it with minerals containing the same elements, it is found to be nearest to heulandite in chemical composition; and Professor How considers it to be the most highly silicated of the aluminous non-magnesian hydrous silicates yet described.

PULVERISING AND MIXING IRON ORES, FLUXES, AND FUEL PREVIOUS TO SMELTING.—A patent has been granted to Mr. John Thomas, of Battersea, for improvements in treating ores, which consists in pulverising the matters to be operated on if not already pulverised, and then mixing them with the following ingredients in the proportions named:—Sand, or ores, reduced to a state of sand, two parts; clay, two parts; chalk, one part; coal, or other fuel, one quarter part. These proportions may, however, be varied according to the quality of the ore, but they must be such that a brick may be formed of the materials used. After they have been well mixed and amalgamated, they are to be formed into blocks or lumps, and then dried and calcined by burning, care being taken during the burning to prevent contact with the air. After calcination the mass is ready for reducing in the manner ordinarily followed in smelting iron ores.

A MINING SCHOOL FOR CALIFORNIA.—The college of California, at Oakland, has recently added a department for mining, the centre of which will be at San Francisco. This department is for the present to be under the superintendence of Mr. W. Blake, as professor of mineralogy, geology, and mining, and of Mr. S. Day, as professor of mine construction and surveying. Chemistry will also be included in this department. Graduates in the course of mining and metallurgy will receive the degree of M.E.

MANUFACTURE OF STEEL DIRECTLY FROM PIG-IRON.—Messrs. Brant and McElroy, of Pittsburgh, Pennsylvania, have recently patented a process for manufacturing steel directly from pig-iron in an ordinary puddling furnace. Pulverised charcoal, or other carbon, is thrown into the furnace when the iron begins to granulate, and the furnace is closed up so as to retain the gases evolved in it.

A NEW FORM OF QUARTZ MILL.—A new form of Chili mill for grinding quartz has recently been patented in New York by Mr. Hitchcock. It is generally admitted that the Chili mill hitherto in use gives a greater yield of gold to the ton of rock than any other process of working, the only objection to it being that it is too slow in its results, for even the heaviest wheels used in the ordinary mills, weighing about 3 tons, are insufficient to crush the particles of quartz sufficiently fine until after the wheel has been made to pass over them several times. Mr. Hitchcock proposes to remedy this defect by placing a circular plate upon the top of these wheels and attaching the driving power directly to this plate, which in revolving carries the wheels with it, the power being transferred through this revolving plate to the periphery of the wheels. Any desirable weight can be given to the wheels by placing weights upon the upper surface of this revolving plate.

BLASTING BY ELECTRICITY.—The United States papers describe an apparatus for blasting by electricity adopted on the Philadelphia and Reading Railway, as far back as 1859, in widening the tunnels on that line. The battery is described as consisting of about twenty-five copper cells, 1' long, by 18" deep, by 1" wide, open at top and bottom, which were set in a wooden frame, and separated from each other by common window glass. Inside of each cell was a plate of zinc, just large enough to allow a slip of grooved wood to hold it away from the copper at the ends. Each zinc plate was connected to the next copper cell, making thus a very large voltaic pile, which was excited by sulphuric acid diluted with about thirty times its weight of water. From each end of this battery an insulated wire ran to the holes to be fired. The frame was arranged to be raised and lowered by a windlass into a wooden trough containing the acid, so that the person engaged in connecting the main wires to those in the holes ran no risk, as the battery was not lowered into the acid until he was at a safe distance. It was found sufficient to insulate one of the wires used for firing by coating it with gutta-percha—the end of the two wires being separated about a quarter of an inch, and connected by a very thin piece of steel wire. Before firing, a number of holes were connected together, by taking the protruding end of one wire of the first hole and twisting it to the end of one of the second, the remaining one of the second to one of the third, and so on. As many as twenty holes were frequently fired in one lot; and for three months nearly one hundred holes per day were fired in each tunnel without a single accident. This system is claimed by the Americans as being almost identical with that of MM. Dumas and Benoit, recently adopted in France, a description of which we shall give next month.

APPARATUS FOR CONCENTRATING ORE.—An apparatus for this purpose is among the latest Californian inventions. By this apparatus it is proposed to improve the manner of sluicing or separating the *gangues* and rock or earthy matter from the ores of valuable metals, after these have been reduced to powder by stamping or crushing, so as to effect by the automatic action of water a perfect separation of the ore from the rock in which it was disseminated. This apparatus has already been in operation near Mokelumne Hill, where it has been successfully introduced for concentrating copper ores. It consists of a common sluice through the bottom of which an upward current of water is made to pass, and through which the heavier particles of ore or metal will pass, while the lighter or earthy portion of the mass to be worked is carried out of the mouth of the sluice.

TREATING WASTE MINERAL PRODUCTS.—Mr. Charles Crockford, of the Greenfield Spelter Works, Holywell, proposes to convert certain waste products resulting from chemical and metallurgical operations into

pigments of commercial value. In each case he employs milk of lime as a precipitant, for the purpose of throwing down the materials held in solution. The precipitate thus obtained is then dried, or otherwise treated, so as to be ready for market. From the solution of manganese obtained in the manufacture of bleaching powder he obtains by this treatment a precipitate applicable as a pigment. The burnt sulphur stone which has been employed for acid making he treats first with muriatic acid, either with or without the aid of heat, afterwards precipitates the iron thus dissolved by the milk of lime which may be used as a pigment. When the burnt sulphur stone contains copper, as it frequently does, he precipitates the copper before adding the milk of lime; and the copper thus obtained being a secondary product reduces to a merely nominal cost the expense of producing the oxide of iron. He utilises the waste muriatic acid by dissolving in it waste materials from smelting works, such as lead, zinc, and copper, precipitating the metallic oxides (which are available as pigments) by the milk of lime.

MANUFACTURE OF CAST-STEEL.—When cast-iron is subjected to the pneumatic process, and deprived of nearly the whole of its carbon, malleable iron is produced. Mr. Robert Mushet, of Coleford, has patented a suggestion which consists in adding to such malleable iron a quantity of melted refined cast-iron, by means of which addition the pneumatised iron is at once converted into cast-steel. This refined cast-iron is cast-iron partially decarbonised and purified from silicon, and may be prepared by any of the known methods. The usual method of preparing such iron is by melting pig or cast-iron in the hearth of the ordinary refinery furnace, and blowing air through twyers down upon the surface of the molten metal until a considerable portion of the carbon and silicon has been eliminated. Refined cast-iron may likewise be prepared by partially decarbonising pig or cast-iron in a melted state by the pneumatic process; or it may be prepared by melting granulated pig or cast-iron mixed with about 10 per cent. of oxide of iron in melting pots or crucibles. The addition of the melted refined cast-iron to the melted pneumatised malleable may be effected in the refinery furnace, or the pneumatic vessel; or the vessel which contains the refined cast-iron may be tapped, and the refined cast-iron run off at once into the pneumatic converting vessel containing the pneumatised malleable iron; or the refined cast-iron may be melted in melting pots or crucibles, and then poured into the pneumatised malleable iron contained in the pneumatic furnace or vessel; or both the refined cast-iron and the pneumatised malleable iron may be poured into a heated ladle, or other heated receptacle, and there mixed. Melted spiegeleisen, or melted manganiferous pig-iron, may be added to the mixture.

THE BLAST-FURNACE SUPERSEDED.—A patent has been taken out by Mr. E. B. Wilson, of Parliament-street, for a new system of managing blast and cupola-furnaces, by which it is alleged that iron of a superior quality is obtained. In applying this invention to an ordinary blast-furnace or cupola, the twyers are removed, and flues constructed for the purpose of taking off the gases, opening into the body of the furnace at or about the level of the molten metal. These gases are conveyed through the flues to a tall chimney, on their passage to which they may be utilised for any required purpose. In order to increase the temperature of the furnace at the gas exits, a number of air-holes are made through the furnace walls, which may or may not be supplied with a blast. In some cases it may be advisable to close in the top of the furnace, and provide it with a feeding-hopper; and even to introduce a blast downwards from the top of the furnace.

NEW ROCK CUTTING MACHINE.—A machine of this kind, manufactured by Messrs. Hawks, Crawshaw, and Sons, of Gateshead, is stated by the

Morning Star to be now at work at Spezzia, in cutting one of the tunnels through the Maritime Alps between that port and Genoa. It is alleged that it cuts a hole of $7\frac{1}{2}$ ' in diameter, at the rate of 14' advance in the twenty-four hours, through very hard rock, consisting chiefly of limestone, with veins of a tougher character running through it. It is confidently stated that the above rate will be considerably exceeded when the workmen get accustomed to the machine; but after making allowance for the variations found to occur in the rock, it appears that an average progress of about 15' per day may be relied on. At this rate of progress the tunnel through the Mont Cenis might be finished in about three years, instead of the eleven which it is computed it will take. Another alleged feature in connection with the invention is its extraordinary economy of labour, three men and a boy being sufficient to work the machine, which can be driven either by steam or compressed air.

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(Compiled from Commissioners of Patents' Journal.—Subject matter only given.)

UNITED KINGDOM.

APPLICATION FOR PATENTS FROM FEB. 23RD TO MARCH 15TH.

- 454 (1864). E. A. COTTELL, Apparatus for concentrating and distilling sulphuric and other acids.
- 463 (1864). B. JONES, Improved method of obtaining sulphur from alkali waste.
- 465 (1864). F. S. CLAXTON, Improvement in casting iron, brass, or copper over or around hollow cylinders of steel, iron, or other metal, using air, water, or other fluid for cooling the casting.
- 476 (1864). G. PARRY, Treatment of slag or the cinder of blast-furnaces for utilising the same.
- 491 (1864). P. H. MURTZ, Manufacture of yellow metal sheathing.
- 497 (1864). F. WEIL, Coating metals with one or several other metals, and oxydising the surface of these latter.
- 510 (1864). J. ROBINSON (com. from J. KENNEDY), Improved machinery for rolling railroad and other bars.
- 521 (1864). C. P. RAEBURN, Production of oil from coal and other mineral substances.
- 534 (1864). W. CLARK (com. from N. O. ANDRE), Improvements in treating and utilising refuse tinned iron and other combined metals.
- 556 (1864). H. COCHRANE, Moulds for casting metals.
- 590 (1864). W. E. NEWTON (com. from L. P. R. and L. R. DE MASSY), Manufacture of baryta and strontian.
- 605 (1864). J. CLAYTON, Improvements in reverberatory and other furnaces for heating and melting iron and steel.
- 607 (1864). W. W. BURDON, Improvements in hewing or getting coal.
- 610 (1864). J. SHORTRIDGE and J. BENNETT, Manufacture of guns, cylinders, and other articles of cast-steel and homogeneous iron, either separately or in combination.
- 611 (1864). H. N. PENRICE, Machinery for tunnelling and driving galleries through rocks and other strata.
- 620 (1864). F. FOSTER, Improvements in miners' safety lamps.
- 665 (1864). A. V. NEWTON (com. from A. SMITH), Construction of cupola furnaces.

PATENTS SEALED FROM FEB. 26TH TO MARCH 24TH.

- 2,293 (1863). G. DAVIES (com. from W. GERHARDT), Manufacture of iron and steel.
- 2,359 (1863). A. V. NEWTON (com. from A. NOBEL), Manufacture of gun-powder and powder for blasting purposes.
- 2,203 (1863). L. MOND, Improvements in obtaining sulphur and sulphurous acid from alkali waste.
- 2,251 (1863). D. S. SUTHERLAND, Improvements in blasting rocks.
- 3,066 (1863). W. and S. FIRTH, and J. STURGEON, Machinery for cutting and boring coal, stone, or other minerals.
- 2,746 (1863). H. BESSEMER, Manufacture of malleable iron and steel.
- 2,327 (1863). R. RIDLEY and J. G. JONES, Apparatus for giving a reciprocating motion to picks and cutting tools used in getting coal and other minerals and stone.
- 2,901 (1863). I. FRANCES, Apparatus for washing, cleaning, and separating impurities from small coal and coke.

3,034 (1863). T. HARRISON, Machinery for cutting coal and other minerals and stones.

3,093 (1863). T. HARRISON, Machinery for puddling iron and steel.

2,357 (1863). J. STURGEON, Machinery for cutting and boring coal and rocks.

2,398 (1863). G. ELLIOT, Improvements in props and supports for coal and other mines.

PATENTS ON WHICH £50 DUTY HAS BEEN PAID FROM FEB. 20TH TO MARCH 5TH.

642 (1861). J. A. PHILLIPS, Manufacture of white lead and other salts of lead direct from ores containing carbonate of lead.

795 (1861). R. RIDLEY and J. ROTHREY, Apparatus for hewing or working coal and other minerals.

PATENTS VOID BY NON-PAYMENT OF DUTY FROM FEB. 13TH TO MARCH 19TH.

408 (1861). W. CLARK (com. from L. J. F. MARGUERITTE and A. L. DE LOURDEVAL), Preparation of alkaline and earthy cyanides.

518 (1857). W. GOSSAGE, Manufacture of soda and potash.

541 (1857). A. PARKES, Improvements in separating tin from tin-plate scrap, and tin or zinc from other surfaces of iron.

514 (1861). R. LAING, Treatment of certain ores containing metals, and obtaining products therefrom.

539 (1861). G. G. SANDEBSON, Furnaces used in the manufacture of armour plates for ships and other structures.

595 (1861). W. H. BUCKLAND, Manufacture of iron.

604 (1857). E. F. JONES, Manufacture of pig and bar-iron.

610 (1857). C. PAUVERT, Certain improvements in manufacturing steel and cast-steel.

627 (1857). W. TAYLOR, Manufacture of iron and steel.

685 (1861). J. J. O. TAYLOR, Separation of siles and silicious and other matters from steel.

747 (1857). Sir F. C. Knowles, Manufacture of cast-steel.

AUSTRIA.

PATENTS DELIVERED AND BECOME VOID DURING DECEMBER.

595. O. E. HÖRNER, Inexplosive blasting powder. [Delivered.]

598. M. COHEN, A zinc furnace fired by brown coal. [Delivered.]

561. E. C. SHEPARD, Furnaces for smelting iron. [Become void.]

563. C. SCHINZ, Manufacture of ferro-cyanate of potassa. [Become void.]

BELGIUM.

PATENTS DELIVERED FROM MARCH 1ST TO MARCH 15TH.

15,696. D. H. BRANDON and W. DOWNER, Apparatus for purifying and mixing mineral oils.

15,721. E. DUPONT, An hydraulic apparatus for the extraction of coal.

15,738. R. MUSSET, Manufacture of cast-steel.

15,756. FAGOT, Conglomeration of ores about to be calcined.

15,764. R. BONEHILL, A furnace for puddling and reheating iron.

15,775. R. DE MASSY, Manufacture of baryta and strontian.

15,776. J. SMITH and R. SAVAGE, Manufacture of sulphuric acid.

15,780. E. A. COTELLE, An apparatus for distilling sulphuric acid.

15,801. F. WEIL, Coating metals.

15,810. J. B. J. DONCKEWOOLKE, A machine for extracting stones from quarries.

15,811. F. L. ROUX, A composition for preserving metal.

FRANCE.

CURRENT LIST OF PATENTS.

- 60,348. MINARY, Apparatus for washing and preparing the scoria of blast-furnaces for agricultural purposes, and for the manufacture of beton, mortar, and cement.
- 60,375. LEBBUN, A parachute apparatus for mines.
- 60,437. MUSHET, Treatment of steel and iron treated according to the pneumatic process.
- 60,456. CLEMM, Using magnesia and its compounds in industry.
- 60,461. GAUDIN, Treatment of iron, steel, and cast-iron in cupolas.
- 60,484. BAUX and GUIOD, Process and apparatus for amalgamating precious metals.
- 60,497. ESCALLE, A mode of charging blast-furnaces.
- 60,509. SCHAFFER and BUDENBURG, Manufacture of gunpowder for blasting.
- 60,510. SUTHERLAND, Improvements in the use of explosive substances for blasting rocks.
- 60,594. PALLU, Manufacture of zinc-white from all kinds of zinc.
- 60,597. DE SAINT-SIMON SICARD, A combined furnace and crucible for smelting metals.
- 60,598. DE SAINT-VIGOR, A process for refining pig-iron.
- 60,614. DONISTHORPE, Machines for the extraction of coal and other ores.
- 60,624. DE LA SOUCHERE, Processes for removing the tin from tin-plate for utilising the same and the untinned metal.

PRUSSIA.

PATENT GRANTED ON FEB. 29TH.

5. T. HUNDT, A machine for charging ores and coals.

UNITED STATES.

PATENTS ISSUED FROM FEB. 9TH TO MARCH 8TH.

- 40,732. W. H. BRUNT and J. W. McELROY, Manufacture of steel.
- 41,588. H. W. ADAMS and W. S. WORTHINGTON, Amalgating and collecting gold and silver.
- 41,647. J. SMITH and J. R. SAVAGE, Manufacture of sulphuric acid.
- 41,671. H. BENNETT, Improved machinery to aid in puddling iron and steel.
- 41,710. E. LAWSON, Improvement in separating and sorting ores.
- 41,763. J. S. DILTZ, Apparatus for amalgamating gold and silver.
- 41,805. J. YATES, Manufacture of iron.
- 41,806. J. YATES, Improved apparatus for the manufacture of iron.
- 41,807. J. YATES, Furnaces and ovens for the manufacture of iron.
- 41,808. J. YATES, Apparatus for the manufacture of iron.
- 41,858. E. F. PRENTISS and R. A. ROBERTSON, Apparatus for distilling rock oil and other hydrocarbons.
- 41,871. A. TEIRAULT, Improvement in distilling rock oil.

SPECIFICATIONS PUBLISHED, AND PRICES.

FROM FEB. 20TH TO MARCH 19TH.

* * Specifications will be forwarded by post on receipt of price and postage at Her Majesty's Patent Office, 25, Southampton Buildings, London, W.C.—The amount of postage may be estimated from the price, as follows:—Where price does not exceed 1*s.* 6*d.*, postage will be 1*d.*; above 1*s.* 6*d.*, and not exceeding 3*s.* 4*d.*, it will be 2*d.*; above 3*s.* 4*d.*, and not exceeding 6*s.* 4*d.*, it will be 4*d.*.—Sums exceeding 6*s.* must be remitted by P. O. O., on Holborn Office, payable to *Bennet Woodcroft*.

- 1,728 (1863). W. HENDERSON, Treating ores for the manufacture of iron and steel; 4*d.*

- 1,763 (1863). E. SONSTADT, Manufacture of sodium ; 4*d*.
 1,872 (1863). A. A. A. DE ROSTAING, Manufacture of iron and steel ; 4*d*.
 1,946 (1863). J. KIRKHAM, Generating heat for smelting ; 1*s*. 10*d*.
 1,980 (1863). A. V. NEWTON (com. from T. ALLIN), Hardening cast-iron ; 4*d*.
 1,981 (1863). J. G. WILLANS, Manufacture of iron ; 4*d*.
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Current Review of Mining, Quarrying, and Metallurgy.

CORNWALL, DEVON, AND WEST SOMERSET.

THE decline of 5*l*. in the copper standard during February, noticed in our last, has been followed by the still heavier one of 7*l*. 10*s*. during the past month, and in addition to this the tin standard has also heavily gone back, having in all receded 6*l*.

Counterbalancing this fall in prices, there have been some important and cheering improvements, among which of course first and foremost is that at *Great Wheal Vor*, which appears to be opening out one of the richest tin mines in the county. The discoveries here, the particulars of which are given below, have, in point of fact, been going on for some months ; but the mine being worked quietly, it is only within the last two or three weeks that the public seem to have known of the real value of these discoveries. The next improvement in importance has taken place at *Wheal Rose*, in which mine Mr. Sampson Waters is the largest proprietor. At *West Seton* too there has been an important improvement. The only other alteration of importance to notice is the improvement at *Great Wheal Busy*, but it seems to have taken some time to penetrate the public with the value of it. Among many of the ruck of mines the only favourable report is upon a winze, and when a mine is driven to report upon a winze alone it is not a very promising sign.

At *Great Wheal Vor* the discovery alluded to above, which has recently excited so much sensation, has been made in Ivey's shaft, where tin was cut 3 fms. below the 147, which improved in 3 fms. sinking, in the 147, to 300*l*. per fm. Four fms. below the 147 the slide was intersected. The lode is not quite through this, but the shaft is already valued at 200*l*. per fm. From the 147 end, east from Ivey's, to the 146, west of Metal shaft, there are 30 fms. of ground to be driven to hole, which holds out every prospect of opening out a rich lode all the way—one end being worth upwards of 200*l*. per fathom. *East Lovell* appears to be holding its ground, the lode in the shaft being reported to be worth 100*l*. per fathom. There has not been much information lately about *Prosper United*, the only point reported upon being that a winze below the 70 is worth 5 tons per fathom. The lode north of the elvan in the 80 is expected to be cut soon. *Sithney Carnmeal* is reported to have improved, the winze in Carnmeal, in the bottom of the 85, being said to be worth 28*l*. per fathom. At *Great Wheal Fortune* in the early part of the month things were very gloomy, and there seemed every prospect of the mine being soon obliged to make calls ; but about the middle of the month a branch of tin was cut in the 102 east of Painter's engine shaft, which has since improved and is reported to be yielding 3 tons of tin per fathom. At *Wheal Curtis* a winze sinking below the 20 is reported to be improving. Operations have been commenced at

Crenver and Wheel Abraham. *Tredoweth*, which a short time ago was in desperate circumstances, has an improvement in the 124, which is worth 7*l.* per fathom; the 134 east is worth 15*l.*, and the 144 west 25*l.* per fathom. *Wheel Trannack* is reported to have improved in the 40-fathom level east, and in the winze below the 20. At *Boscawell* the 100 west of Treweek's is worth 20*l.* per fathom.

At *North Crofty* the lode in the 170 east is worth 35*l.* per fathom, and the 160 east from 25*l.* to 30*l.* per fathom. At *North Roskear* the stamps are expected to be at work in about two months, when the accumulation of the tinstuff to stamp will be about equal to 15 tons of tin. At *Wheel Seton* Tilly's shaft, sinking below the 150, is worth 18 tons per fathom for the length of the shaft; the 150 west, on the south part, worth 7 tons; 150 west, on the north part, worth 4 tons; Bull's shaft is also improved. At *West Seton* there has been a great improvement in the 110 west; the end is worth 100*l.* per fathom, and is 100 fms. short of the western boundary; the 110 west, on the north lode, worth 3 tons per fathom; 110 east, 5 tons; it is expected this lode will be cut 40 fms. further east, and also at the 100-fm. level, in about two months.

At *Camborne Vean* the lode in the shaft is reported to be worth 40*l.* per fathom. At *St. Day United* the 97, on Garby's lode, is said to be in a good course of copper ore, worth 6 tons per fathom. *Tincroft* is looking well. The 173 east is worth 40*l.* per fathom, and the 200 east of Cook's Kitchen, 50*l.* per fathom. More tin and copper is being opened than can be taken away. A discovery of silver has been made at *Wheel Hartley*, a mine in the same district as North Dolcoath, which made considerable returns of silver some years ago. Pryce's shaft at *Conduarrow* is sunk to the 200, through a lode 9 feet wide, furnishing low produce work. The whole of the stamps, 96 heads, are expected to be at work in a couple of months. *Wheel Grenville* continues to open up well. The lode in the 110 is expected to be cut very soon, and there are great expectations of its proving rich. At *Wheel Rose* a fine lode has been cut in the 80, of which high expectations are formed. The water is now so strong that the men cannot get near the end. *Great Wheel Busy* is improved in appearance, the 130 being in a good course of ore, worth 40*l.* per fathom. At *Boscawen* the 70 west is worth 30*l.* per fathom.

At *West Chiverton* the 80 east on William's lode is worth 15*l.* per fathom; the 80 west, 80*l.* per fathom. The works at the numerous new mines in this district are progressing satisfactorily. Since our last two new sets have appeared on the scene called respectively *Great West Chiverton*, and *Great South Chiverton* adjoining West Chiverton on the south.

At *East Caradon* the 80 east, on the caunter lode, is reported to be worth 25*l.* per fathom, the 80 west 20*l.* to 25*l.* per fathom. The only point reported on at *Wheel Hope* is that a pitch in the back of the 75 is worth from 15*l.* to 20*l.* per fathom.

A fair lode has been cut in the 84 east at *Wheel Crebor*. *Frank Mills* is reported to be looking well.

At *Botallack* meeting it was resolved to present Mr. James with the sum of 50 guineas for his services during his management of the mine. At *Tincroft* meeting (on March 15th) several resolutions were passed respecting some alleged irregularities in the share register on the part of the ex-directors. It appears that all the shares have been sent in for registration except thirty, which it was resolved to advertise. At *West Basset* meeting (on March 23rd) it was announced that the appeal to the Exchequer Chamber in the action of *Lyle v. Richards* has been set down for hearing at the sittings after the ensuing Easter term.

Among the new companies announced during the month have been:—*The East Tywarnhaile Mining Company* (limited), with a capital of 30,000*l.*,

in 6,000 shares of 5*l.* each, formed for the purpose of working the mine of that name, situated immediately to the east of Great Tywarnhaile Mine. The purchase money is to be 6,000*l.* The *West Tremayne* Tin and Copper Mine, on the cost-book system, in 6,400 shares of 1*l.* each, the object of which is to work a piece of ground in St. Erth parish, and including the sett of Old Wheal Jewell. The *North Wheal Seton* Copper Mining Company (limited), with a capital of 25,000*l.*, in shares of of 25*l.* each, formed for the purpose of working the mine of that name, situated between South Seton and the Camborne Mines.. This mine is brought out under the auspices of Messrs. C. and C. Thomas, who brought out Wheal Prudence. A company under the ambitious title of the *Devon Consols* Tin Mining Company (limited), with a capital of 15,000*l.*, in shares of 1*l.* each, the object of which is to work some tin mines on Dartmoor, including Batchelor's Hall, White Works, Nun's Cross, and Ailsborough Tin Mines, all of which have hitherto proved signal failures. The *New Devon Consols* Copper Mining Company (limited), with a capital of 50,000*l.*, in 2,000 shares of 25*l.* each, formed for the purpose of working a piece of ground adjoining Devon Great Consols.

WALES AND THE BORDERS.

SOUTH WALES.—The great activity which has for some time prevailed in the iron trade has been somewhat checked during the past month. The various works are still, however, fully employed, though the demand has not been so large, and prices have declined; a better demand has, however, sprung up for foreign markets, and particularly for Spain. There has been a great deal of agitation going on among the miners, colliers, and puddlers of South Wales, in reference to a further rise in wages. Some few weeks since notices were given by the men employed at several works that they would leave at the end of the month unless they received an advance of from 5 to 10 per cent. more than the masters offered. At one of the ironworks the puddlers asked no less than 20 per cent. rise, which, of course, was at once refused. At another work the men insisted on not only a second rise in wages, but also weekly payments, which the masters declined to grant, and the result was a turn out, but the majority of the hands have since wisely accepted the offer of their employers. The market having for the last two or three weeks shown a tendency to decline, the iron and coal masters at once saw the importance of checking the movement of the men, and Mr. Crawshaw Bailey, M.P., has taken the bold course of giving one month's notice to all the hands in his employ. Other masters have determined to resist any application for a further rise, and it seems pretty clear that the wages question will be settled by the works being stopped, unless the men submit to the terms offered.

It is stated that the *Hirwain* works, which have been at a standstill for nearly six years, have passed into the hands of Messrs. Hinde and Co., and that no time will be lost in placing the machinery, furnaces, &c., in working order. It is also reported that a Liverpool and Manchester company are in treaty for working the blast-furnaces at *Trimsaran*, near Llanelly; and arrangements are in progress for recommending operations at several other old works. The necessary repairs to the *Penydarren* works are being rapidly proceeded with, and the forge and several of the furnaces will shortly be in full operation.

It appears that Belgian iron is being imported into South Wales, as Mr. Foster, of Swansea, states that he has purchased from the *Ougres* Iron Company at Liège 6,000 tons of pig-iron, and that the reports of the quality of the iron are satisfactory.

In the steam-coal trade a fair amount of business has been done, and there has been a good demand for house-coal. Most of the pits are at

present working with the greatest activity, and throughout the whole of the district a scarcity of hands is more or less experienced. At the Aberdare Coal Company's *Cwmback* Colliery alone a large number of hands is wanted. The colliers of the Aberdare Valley having made a request for a further advance in wages, the proprietors of the collieries in that district have resolved not to accede to their request. The masters have formed themselves into a Steam Coal Association, and in a short time a sum of £25,000 will be paid into the West of England Bank, Cardiff, to enable any colliery proprietor to resist unreasonable demands on the part of the workmen.

During the month of February 490 vessels were engaged in the trade of Swansea, with a registered tonnage of 60,343 tons, and the shipping rates received amounted to 1,541*l.* 5*s.* 10*d.* As compared with the corresponding month of 1863, there was an increase of 93 vessels, 8,455 tons registered tonnage, and 150*l.* 7*s.* 3*d.* in shipping dues. The excellent demand which prevails for coal and iron, the former especially, and the moderately favourable weather of the month, were the chief causes of the large increase. Neath and Briton Ferry exported 19,097 tons coal, coke, and culm, 991 tons of bar iron, 251 tons of tin plates, and 145 tons of copper, making a total of 20,484 tons, against 18,173 tons in the corresponding month. The imports were 5,607 tons of iron ore, 3,218 tons of copper ore, and 2,031 tons of pig-iron, making a total of 10,856 tons, being an increase of 675 tons, as compared with February, 1863. A large trade was also done at Newport, Llanelly, and the smaller ports of South Wales. The arrivals into Swansea have been:—Iron ore from Cherbourg; cobalt ore from Guaycan; copper ore from Lisbon and Almera; and sulphur ore from Catanta.

The returns of the trade of the port of Cardiff for the month of February show that the exports were 130,000 tons of coal, nearly 16,000 tons of iron, 3,400 tons of patent fuel, and 152 tons of coke. As compared with the month of January, there was an increase of 13,000 tons in coal and nearly 10,000 tons in iron, which is accounted for principally by the favourable weather and the fact that the colliers worked more regularly than was the case in the previous month. The import trade is improving, and the number of vessels arriving in ballast is gradually decreasing. Iron ore, pig-iron, and pitwood formed the principal imports during the past month.

The new undertakings announced during the month have been:—The *United Merthyr Collieries* Company, with a capital of 120,000*l.*, in shares of 20*l.* each, which has been formed for the purpose of working two well-known colliery properties in South Wales—the Forchaman and Cwm Neol, Aberaman, Bedlwyn, Tirtlaithy, Pwllfa, &c.; and the *Cwmsymlog United Silver-Lead Mines* Company, with a capital of 50,000*l.*, in shares of 5*l.* each, formed for the purpose of purchasing the works, plant, and machinery on the mines of the same name, which are in full operation. The property is to be transferred to the company for 3,000 shares; or, if the directors deem it desirable, 1,000*l.* may be paid in cash.

GLoucestershire.—The imports into Bristol have been:—240 tons of lead ore from Carlsforte, and 80 tons from Aberystwith; 195 tons of sulphur from Pomaron, and 35 barrels from Liverpool; 125 tons of sulphur ore from Arklow; and 93 tons of silver-lead ore from Truro. During the present year 416 tons coal and 1,136 tons iron have been shipped oversea from Bristol, as against 1,225 tons of coal, and 1,312 tons iron in the two months of January and February in 1863, showing a decrease of 809 tons of coal, and 176 tons of iron.

The imports into Gloucester include:—40 tons of coal from Newport, 50 tons from Landshipping, 50 tons from Llanelly, and 72 tons from Saundersfoot; 545 tons of sulphur ore from Pomaron; 220 tons of pig-iron from

Ardrossan, and 101 tons from Glasgow; 60 tons of iron from Cardiff, and 90 tons from Briton Ferry. The exports include:—257 tons of coal, 479 tons of iron, 312 tons of ore, and 287 tons of burnt ore.

NORTH WALES.—The *Vigra and Clogau* Mining Company have received 730oz. 15dwts. 16grs. of gold for the four weeks ending March 13th, being the produce from 94 tons 5 cwts. 2 qrs. 7 lbs. of quartz.

MIDLAND COUNTIES, SOUTH LANCASHIRE, AND SOUTH YORKSHIRE.

STAFFORDSHIRE AND WARWICKSHIRE.—The iron trade has been dull, and the number of orders for home use has been only limited. Some of the smaller makers have received orders at reduced rates, but the principal firms have adhered to the higher prices. America continues to receive large supplies, and the demand for India is also increasing, but the continental orders have not been very large. Scotch pig-iron seems to be slowly recovering from its late depression.

On March 1st a boiler explosion took place at the works of Mr. Thomas Jackson, at *Hall End*, West Bromwich, by which nine men lost their lives, and several others were seriously injured, besides causing great damage to the works.

The price of coal has in some districts been slightly reduced, but the continuance of the cold weather has kept up a large demand.

DERBYSHIRE.—The iron trade of this district has been in a very healthy condition. The demand for bars and plates has been good, and there has been a brisk inquiry for railway iron, which is likely to continue, in consequence of the schemes for laying down various new lines.

An accident occurred on March 15th, at the *Spiritwell* Ironstone Mine, Chesterfield, the property of Mr. Barrow, caused by the pump breaking, and inundating the mine; no lives, however, were lost.

The coal trade has been active, with a good demand for the London market.

SOUTH YORKSHIRE.—The iron trade continues to be active, and the coal trade has been as brisk as can be expected considering the number of men that are out on strike.

SOUTH LANCASHIRE.—The general condition of the coal trade has been satisfactory, except in the St. Helen's district, where the unsettled state of the colliers has greatly reduced the supply of coal.

The iron trade has been brisk, and latterly manufacturers have executed orders with more promptness. It is announced that the *Low Furness* Iron and Steel Works, lately in the hands of the Ulverstone and Lancaster and Furness Railway Companies, have been disposed of to a firm in Dudley, who will shortly commence operations. A new furnace has been put in blast at Hindpool.

NORTHERN COUNTIES. NORTH LANCASHIRE AND NORTH YORKSHIRE.

NORTHUMBERLAND AND DURHAM.—A fair amount of business has been done in the coal trade, and the steam-coal collieries have been well employed, considering the season of the year. There is likely to be some agitation in this district on account of the demands of the colliers for higher wages, which many of the proprietors do not feel justified in giving.

The iron trade has been in a very satisfactory condition, although towards the end of the month prices had rather a downward tendency.

The *Consett Ironworks*, in the county of Durham, it is stated, have been disposed of to a public company, composed chiefly of the creditors of the late District Bank. The price obtained for the entire establishment is 295,000*l*. This sum includes the works both at Consett and at Bishopwearmouth. It is a matter of great satisfaction to the trade of the north that this very satisfactory arrangement has been arrived at. The works are very extensive, and recently have had a high reputation for making iron plates and angles.

The state of the blast-furnaces of the Cleveland district on March 1, 1864, was as follows:—

Places and Owners.	In.	Out.	Total.
Eston—Bolckow and Vaughan	9	—	9
„ Clay Lane Company	3	—	3
„ South Bank Company	3	—	3
Cargo Fleet—Jones, Dunning and Co.	2	—	2
„ Cochrane and Co.	4	—	4
„ Gilkes, Wilson, Pease and Co.	5	—	5
Middlesborough—Bolckow and Vaughan	4	—	4
„ Hopkins and Co.	2	—	2
Port Clarence—Bell Brothers	5	1	6
Norton—Warner, Lucas and Barrett	3	—	3
Stockton—Holdsworth and Co.	3	—	3
Ferry Hill—J. Morrison	3	—	3
Thornaby—W. Whitwell and Co.	3	—	3
Darlington—South Durham Company	3	—	3
Witton Park—Bolckow and Vaughan	4	—	4
Stanhope—Weardale Iron Company	—	1	1
Towlaw—Weardale Iron Company	5	—	5
Consett—Derwent Iron Company	7	11	18
Total	68	13	81
All places, Mar. 1st, 1858	44	19	63
„ „ 1859	59	8	67
„ „ 1860	53	16	69
„ „ 1861	51	25	76
„ „ 1862	51	25	76

A new company has been formed called the *Cleveland Iron Company*, with a capital of 100,000*l*., in shares of 5*l*. each, for obtaining and working the iron ore on the Skelderskew and Fowle Green estates, in the Cleveland district. The property comprises about 220 acres, held for 99 years, at 300*l*. per annum rent, merging into a royalty of 4*d*. per ton of 22½ cwt., and is said to possess unusual facilities for railway and water carriage.

The exports from the Tyne include:—131,924 tons of coal; 12,945 tons of coke; and 37,078 cwt. of iron. The imports comprise:—23,165 bars, and 1,711 pigs of lead from Carthage; 6,351 bars of lead from Alicante, and 2,460 from Almeida; 2,650 pigs of lead from Seville; cargoes of pyrites from Drontheim, Seville, Cadiz, Cherbourg, Pomaron, Antwerp, and Levanger; 14 tons of copper ore from Carthage; 100 tons of iron ore from Garrucha; cargoes of iron from Gothenburg and Aguilas; and 115 ingots of lead from Gothenburg.

CUMBERLAND.—A new company has been announced, called the *Cumberland Consolidated Lead and Copper Mining Company*, with a capital of 60,000*l*., in shares of 5*l*. each, and which has been formed for the purpose of re-working the Roughten Gill, Dry Gill, and Carrock End Mines. The

purchase money has been fixed at 20,000*l.* in cash, and 10,000*l.* in paid-up shares.

WESTMORELAND.—It is said that a valuable discovery of ironstone has been made near Appleby, on the estate of Mr. John Atkinson.

SCOTLAND.

There is nothing fresh to notice in the coal trade, a fair demand at good prices having been still maintained.

The market for all kinds of iron has been very flat, and prices have had a downward tendency.

CONTINENT OF EUROPE AND MEDITERRANEAN COUNTRIES.

FRANCE.—The iron trade at St. Dizier has been firmly maintained during the past month, the various works having been well supplied with orders. Prices remain unaltered. The orders of late have referred principally to machine iron and sheets, merchant's iron having been in rather less demand. Refinery pig continues in good demand in the Haute-Marne district.

BELGIUM.—There has been a rise in refinery pig in the Charleroi district, and it is reported that an upward tendency in prices is becoming general in other districts also. It is said that the *Thy-Le-Chateau* Company intends constructing a blast-furnace at Charleroi. At *Hourpes-sur-Sambre* one of the blast-furnaces is to be re-lighted, for the purpose of making refinery pig, and the other one belonging to the same works is also expected to be shortly put into blast. The *Marcinelle* Company are also about to relight a blast-furnace, and another is in course of construction by MM. L. Gillain and Co. A large German contract has just been concluded at the new rolling works of MM. Victor Gilleaux and Co.

NORTH AMERICA.

LAKE SUPERIOR REGION.—Favourable reports continue to be received from the mines of this district, which appears to be rapidly increasing in importance. At *Aetna* the veins are reported to be keeping up their character in depth. It is said that more copper is being taken out than will pay all expenses. Active preparations are being made for putting the engine up, and operations generally are progressing very satisfactorily. At *Atlas* the lode in the greenstone continues to look promising. *Amygdaloid* is reported to be looking better than ever; the stamps are progressing rapidly and are expected to be soon in operation. At *Manhattan* work on the new shaft south of the greenstone has been abandoned, and operations have been resumed at the old mine (Albion).

UNITED (ATLANTIC) STATES.—The petroleum report for 1863 states that the yield of the Pennsylvania Petroleum Wells in the beginning of that year was from 4,000 to 4,500 barrels per day, but in the autumn the quantity sometimes amounted to from 8,000 to 10,000 barrels per day. The total production for 1863, as nearly as can be ascertained, is reported to have been 2,000,000 barrels. Prices varied widely, having ranged from 20 to 60 cents.

A number of new rolling mills have been put up during the past year at Pittsburg—one, at the Sligo works, capable of turning out armour plates of the largest size.

UNITED (WESTERN) STATES.—It is reported that a valuable bed of gypsum has been discovered on the *Saginaw Bay*, which is to be worked on

a large scale. The quality is said to be fine and pure, and the quantity inexhaustible.

CALIFORNIA AND BORDER TERRITORIES.—The following is the amount of treasure receipts in San Francisco during the three years from 1861 to 1863 :—

From the Northern Mines, 1861	..	..	\$32,325,863
" " 1862	..	..	34,385,097
" " 1863	..	..	37,915,395
From the Southern Mines, 1861	..	..	9,363,214
" " 1862	..	..	8,154,702
" " 1863	..	..	7,411,981

A new discovery of quicksilver is reported to have been made in *Mariposa* county, which has caused a good deal of excitement there, and which is expected may turn out to be of great value.

It is said that a most important discovery has been made of a salt bed, near Sand Springs, in *Nevada* territory, on the overland wagon road. This bed is reported to consist of pure salt 14' in thickness, ready for quarrying and sending to market. It is also stated that a new coal-field of considerable extent has recently been discovered in the Desert district in this territory.

Advices from *Reese* river state that both the mines and mills in the Austin Cañon are working steadily and giving satisfactory results. Some very fine specimens of silver ore have been lately discovered, and, altogether, mining in this district is reported to be progressing successfully.

The French company at Rhodes diggings, in *El Dorado* county, are, it is said, obtaining very rich rock, to crush which a quartz mill is shortly to be erected.

Reports of a very favourable character continue to be received from the mines of *Lower California*. The mines are, it is stated, opening out well, and several new mills are nearly ready to be put to work. The Peninsular and Trinidad Companies also are about to erect a twenty-stamp mill.

A number of mines, chiefly silver, seem to be opening up about *Owensville*, above San Carlos, which are said to promise most favourable results.

SOUTH AMERICA.

BRAZIL.—The directors of the *St. John del Rey* Mining Company have received their monthly report, dated Morro Velho, February, 1864 :—Produce for January, 40,384 oitavas ; cost for January, 10,246*l.* ; profit for January, 5,323*l.* Produce ten days of February, 10,552 oitavas ; yield, 5,723 oitavas per ton.

The *Don Pedro North del Rey* Gold Mining Company have received the following report for January :—The produce for January amounted to 1,059 oitavas of gold. The decrease was caused by the influx of water in Bawden's Mine, owing to the unusually wet season.

The *Anglo-Brazilian* Gold Company have also received reports which state that on January 20th operations had been commenced, and were being pushed on as fast as possible.

CHILE.—The *Copiapo* Mining Company have received advices dated Feb. 4, as follows :—Checo : The lode in the winze sinking east below the 65 still indicates further improvement. The lode in the 50-fathom level east of Price's shaft has a more favourable appearance, and yielding good stones of ore. The prospects at Dulcinea mine are reported to be favourable, as the lode seems to improve in depth.

The *Panulcillo* Copper Company have received advices from their manager, dated February. The quantity of ore extracted from the mine

in January had been about 2,500 tons. The production of regulus from the seven furnaces in the same month had been 10,300 quintales, which had been delivered under satisfactory contracts to Chili smelters.

AUSTRALASIA.

VICTORIA.—The directors of the *Port Phillip and Colonial Company* have received advices up to January 22, which state that the quantity of quartz crushed during December was 3,204 tons, yielding 1,817 oz. 13 dwts. of gold. The total receipts were 3,044*l.*; the total payments, 2,113*l.*, and the profit, 931*l.* The month of January will show a very small return, in consequence of the machinery being idle for nearly a fortnight during the time the Clunes Company were repairing their boilers, &c.

SOUTH AUSTRALIA.—Mr. Hargraves has commenced his explorations, and it is reported that on December 2nd he found signs of gold at Bullaparinga.

The Australian companies have received advices up to January 27th. At *English and Australian* the stock of coal at Port Adelaide was 470 tons, at Kapunda 94 tons, and at Koorunga 363 tons, besides shipments afloat. The furnaces at the Burra were let out for the summer period. At the Port works there were six furnaces and one refinery at work.

At *Kapunda* the quantity of ore raised in November was 275 tons of 17 $\frac{3}{4}$ % average produce, equal to 47 $\frac{1}{2}$ tons of pure copper, exclusive of 50 tons of sulphur ores for flux. The quantity raised in December is estimated at about 290 tons of good average produce.

At *Worthing* the ore raised and dressed was 240 tons, the largest quantity yet raised in four weeks, of the average quality. The smelting had been suspended owing to the harvest, but was expected to commence again immediately.

At *Great Northern* at Nucaleena Mine the ground still continued hard, and the rate at which they were sinking was proportionately slow. At the *Oratunga* Mine the appearance of the lode had decidedly improved at the end of the drive; and had there been more of a 'back,' it would probably have paid to work on tribute.

From *Wheat Ellen* Captain Barker reports that Squarey's engine shaft has yielded about 35 cwts. lead, and 3 cwts. of yellow sulphate of copper in the last 7 ft. sinking, and though not looking quite so promising at present is expected to improve shortly.

Record of the Mining and Metal Markets.

METALLIC-ORE MARKETS.

TIN.—The standards for black tin have been reduced since our last 6*l.* on fine and 7*l.* on common, making present quotations:—

Superior Fine	..	£109	....	Superior Common	..	£107
Second Fine	..	105	....	Second Common	..	104

The *West Briton* remarks that this decline is no more than everyone has been expecting for some time past. This drop in the standard will materially affect our tin mines and throw them back to the same position as they were at the beginning of the year.

COPPER.—At the four Cornish sales we give this month the number of tons, average produce, quantity of fine copper, average price per ton, and standard have been as follows:—

Date.	Tons.	Produce.	<i>Fine Copper.</i> Tons. cwt.	Price per ton.	Standard.
Feb. 25. ..	3,874 ..	6 ..	201 19	£5 3 6	£132 11 0
Mar. 3. ..	2,904 ..	6½ ..	191 4	5 15 0	129 2 0
" 10. ..	2,113 ..	6 ..	127 15	5 1 0	129 2 0
" 17. ..	5,133 ..	5½ ..	282 18	4 10 0	131 15 0

The copper standard has again declined during the past month. At the sale of Feb. 25th it fell 2*l.*; at that of March 3rd, 15*s.*; at that of the 10th, 3*l.*; and at that of the 18th, 1*l.* 10*s.*; making altogether the large decline of 7*l.* 5*s.*

LEAD.—This month's prices of lead ores show a slight decline on those of last.

COAL MARKETS.

LONDON, March 29th.—From the returns of the Registrar of the London Coal Exchange, of the quantity of sea-borne coal, culm, and cinders, imported into London in the month of February, we learn that the total quantity was 288,233 tons, against 325,879 tons during the corresponding month of last year,—showing a *decrease* of 37,646 tons.

The following are the particulars of the 288,233 tons imported during February:—

Newcastle ..	111,210 tons in	254 ships	Scotland ..	2,641 tons in	15 ships
Seaham ..	10,660 "	45 "	Wales ..	11,085 "	32 "
Sunderland ..	89,666 "	202 "	Yorkshire ..	1,718 "	19 "
Middlesbro' ..	4,172 "	10 "	Small ..	1,479 "	6 "
Hartlepool ..	52,210 "	181 "	Cinders ..	817 "	9 "
Blyth ..	2,575 "	9 "			

The quantity of coal imported by railways and canals during the month of February was 224,666 tons, against 132,354 tons in the corresponding month of last year,—showing an *increase* of 92,312 tons.

On February 29th, the new ships arrived were 93; market dull. Hetton Wallsend, 18*s.* 6*d.*; South Hetton Wallsend, 20*s.*; Haswell Wallsend, 18*s.*; Tees Wallsend, 18*s.*; Braddyll's Wallsend, 18*s.* 6*d.*; Eden Main, 16*s.*; Belmont Wallsend, 16*s.* 6*d.*; Heugh Hall Wallsend, 16*s.* 6*d.* On March 2nd, new ships 23; market depressed, and house-coal reduced from 3*d.* to 6*d.* per ton. On the 4th, new ships 16; market quiet. On the 7th, new ships 22; the demand for house-coal more active, with a slight advance in prices. On the 9th, new ships 18; tone of market more favourable, with an advance of from 3*d.* to 6*d.* per ton. On the 11th, new ships 49; another general advance of 3*d.* per ton. On the 14th, new ships 71; market brisk. Hartley's scarce and rose 9*d.* per ton. On the 16th, new ships 80; market less active. On the 18th, new ships 123; a fair amount of business was transacted. On the 21st, new ships 29; an active demand for house-coal and an advance of 3*d.* On the 23rd, new ships 18; a continued demand, with a further rise of 3*d.* in Hartley's. On the 25th, being Good Friday, there was no market. On the 28th, new ships 138; a large business done, but a fall of 3*d.* per ton in Hartley's. Hetton Wallsend, 19*s.* 6*d.*; South Hetton Wallsend, 19*s.*; Haswell Wallsend 19*s.*; Tees Wallsend, 18*s.* 6*d.*; Hartlepool Wallsend, 18*s.* 6*d.*; Heugh Hall Wallsend, 17*s.* 6*d.*; Eden Main, 17*s.* 3*d.*; Hasting's Hartley, 16*s.* 9*d.*; Tanfield Moor, 14*s.* 6*d.*

LIVERPOOL.—From Messrs. J. and T. Platt's Coal Circular for February, we find that the quantity of coal, cannel, coke, and patent fuel shipped from Liverpool to foreign and colonial ports during the month of February was 74,951 tons, against 51,949 tons during the corresponding month of last year—showing an *increase* of 23,002 tons. The exports coastwise during February were 10,498 tons, against 7,168 tons during the same month last year—showing an *increase* of 3,330 tons. The total exports coastwise from January to February, were 18,214 tons, against 12,583 tons during the corresponding period of 1862—showing an *increase* of 5,631 tons.

CONTRACT FOR COAL.—The Admiralty require the supply of 6,000 tons of South Wales coal, to be delivered at Shanghai.

SHARE MARKETS.

LONDON, March 29th.—On the whole a very considerable amount of business has been transacted in the London share market during the past month notwithstanding the heavy decline in the standards both for copper and tin. The principal alterations have been :—

Advanced.

Great Wheal Vor	£13	Wheal Grenville	£3
South Caradon	20	West Seton	15
North Shepherds	slightly	Wheal Seton	17½
East Lovell	1½	Clifford Amalgamated ..	slightly
Great Wheal Fortune ..	1½	Stray Park	6½
Calvadrack	1½	Treloweth	slightly
Wheal Kitty (Lelant) ..	1	East Lovell	1
Wheal Margaret	1½	Cape Copper	4
East Basset	6	Anglo-Mexican Mint ..	3

Declined.

East Caradon	£2½	Tincroft	£1½
West Caradon	slightly	Condurrow	10
Wheal Chiverton	1½	New Rosewarne	1
East Chiverton	1	Pendeen	1½
Herodsfoot	2	Prosper United	slightly
Nanjiles	4½	St. John Del Rey	5

Attention has been principally directed to *Great Wheal Vor* shares, which have advanced 13*l.* per share since our last quotation. They opened on the 26th at 24*l.*-25*l.* ; on the 29th they were quoted at 29*l.*-31*l.*, and on the 1st they reached 36*l.*-37*l.*. From that price they receded to 31*l.*-32*l.* on the 7th, but gradually recovered again, and went up on the 16th to 40*l.*-41½*l.*, since which, however, they have slightly declined, closing at 37*l.*-38*l.* *Great Wheal Fortune* shares opened on the 27th at 15½*l.*-16½*l.*, being an advance of 1½*l.* on our last quotations, and after but few variations close the same. *East Lovell* shares have been dealt in at slightly better prices, closing at 9½*l.*-10½*l.* *Wheal Margaret* shares opened on the 27th at 18*l.*-19*l.*, being a rise of 1*l.* upon our last prices, and improved again on the 18th to their closing quotation of 18½*l.*-19½*l.* *Wheal Basset and Grylls* shares opened lower on the 3rd at 14*l.*-15*l.*, but gradually recovered, and close at 16½*l.*-17½*l.* *Providence*, 41*l.*-43*l.* *Wheal Grylls*, 26*l.*-28*l.* *Calvadrack*, 7½*l.*-8*l.* *Wendron Consols*, 7*l.*-7½*l.* *Wheal Kitty (Lelant)*, 13½*l.*-14½*l.* *East Grylls*, 13*l.*-14*l.* *St. Ives Consols*, 30*l.*-32*l.* *East Providence*, 4½*l.*-4½*l.* *Trelgion Consols*, 11*l.*-12*l.* *Grylls Wheal Florence*, 3½*l.*-3½*l.* *Sithney Carn-*

meal, 6½l.-6½l. *Sithney Wheel Metal*, 5l.-5½l. *West Wheel Metal*, 5l.-5½l. *Wheel Fortune*, 16l.-17l.

There has been very little fluctuation in *West Chiverton* shares, which close at 80l.-85l. *Wheal Chiverton* shares have receded from their last quotation of 14l.-14½l. to 12½l.-13l. *Wentworth Consols* shares have been inquired for and have steadily advanced from their opening quotation or 13l.-14l., on the 10th, to their closing one of 17l.-18l. *East Chiverton* shares have slightly declined to 4l.-4½l. There has also been a decline in *Herodsfoot* shares, which opened on the 27th at 34l.-36l., at which they remained till towards the end of the month, when they fell to 32l.-34l., at which they close. *Wheal Mary Ann* shares opened on the 27th at 12½l.-13½l., and during the first part of the month went up to 14½l.-15l., but afterwards receded again, and close as they opened, at 12½l.-13½l. *North Shepherd* shares opened on the 27th at 4½l.-5l., and after almost daily fluctuation close dull at 4½l.-4½l. *Wheal Ludcott and Wrey*, 2½l.-3l. *Wheal Trelawny*, 23l.-24l. *Wheal Hope*, 4l.-5l. *Chiverton Moor*, 5½l.-5½l. *North Chiverton*, 2½l.-2½l. *Cargoll*, 36l.-38l. *Chiverton Valley*, 5l.-5½l.

East Caradon shares have slightly fallen off from the advance which they made last month. They opened on the 27th at 32½l.-33l., and gradually declined until the 14th, when they were quoted at 29½l.-30½l. They rallied a little after that day and close at 30½l.-31½l. *West Caradon* shares have also slightly declined from their last quotation of 21l.-23l., their closing price being 20½l.-21½l. There has been an advance of 20l. in *South Caradon* shares, which opened at 430l.-440l., and close at 450l.-460l. *Glasgow Caradon*, 3½l.-4½l. *South Caradon Wheal Hooper*, 10s.-12s. *Caradon Vale*, 3½l.-3½l. *Marke Valley*, 6l.-6½l. *Gonamena*, 4l.-4½l.

East Basset shares have advanced during the month. They opened on the 27th at 66l.-68l., and on the 1st rose to 67l.-69l., at which they remained until the 15th, when there was a relapse of 3l. On the 21st, however, shares went up again to 67l.-69l., and were inquired for on the 22nd at 69l.-71l. On the 24th there was another advance to 70l.-72½l., which was not sustained, shares closing lower at 69l.-71l. *Wheal Grenville* shares have also advanced from their opening quotation of 5½l.-6½l. to their closing one of 8½l.-8½l. *Wheal Basset*, 90l.-95l. *North Basset*, 2l.-2½l. *Wheal Buller*, 32l.-34l. *East Grenville*, 2½l.-3½l. *South Grenville*, 5s.-6s. *Copper Hill*, 12l.-13l. *Great Basset*, 65l.-67l.

Clifford Amalgamated shares have been dull, with but little fluctuation from their opening quotation of 35½l.-36½l., leaving off at 36l.-37l. *Nan-jules* shares have also been quiet. They opened on the 27th at 34½l.-35l., and steadily declined to their closing price of 30l.-31l., making a fall of 4½l. during the month. *St. Day United*, 37s.-38s. *Great Wheal Busy*, 5½l.-5½l. *Gambler and St. Aubyn*, 10l.-12l. *East Carn Brea*, 7l.-7½l. *Wheal Uny*, 6l.-6½l. *South Tolgus*, 40l.-45l. *Great South Tolgus*, 3½l.-4l. *North Downs*, 1½l.-1½l. *North Treskerby*, 3l.-3½l.

Wheal Seton shares opened better on the 27th at 180l.-182½l., and have been pretty firm all through the month, going up at one time to 197½l.-202½l. They close flatter, however, at 192½l.-197½l. *West Seton* shares have also been inquired for at higher prices. They opened at 185l.-190l., and close at 206l.-215l. *North Roskear*, 24l.-26l. *North Crofty*, 4½l.-5l.

New Rosewarne shares have not sustained the briskness which they exhibited last month, and their closing price of 11l.-12l. shows a decline of 1l. *Pendeen Consols* shares have also declined, being last quoted at 5l.-5½l. *Prosper United* shares have been dull, and have declined slightly from last months prices of 7l.-7½l. to their closing quotation of 6½l.-6½l. *Treloweth* shares are slightly better at 2l.-2½l. *West Trevelyan*, 1s.-1s. 6d. *Wheal Walliser* (St. Agnes), 7½l.-7½l. *East Rosewarne*, 2½l.-3l. *Great Retallack*, Tanfield 10s. *New Birch Tor and Vitiifer Consols*, 2½l.-3l.

There has not been much business done in *Tincroft* shares, which have slightly declined. They opened at last month's closing prices of 20*l.*-21*l.*, and leave off at 18*½l.*-19*½l.* *Stray Park* shares have been in request at an advance of 6*½l.* They opened at 28*½l.*-29*½l.* and close at 35*l.*-36*l.* *Condurrow* shares have declined 10*l.*, being last quoted at 90*l.*-100*l.* *South Condurrow* shares have been better at 1*½l.*-1*¾l.* *Carn Camborne*, 5*s.*-7*s.* 6*d.* *Wheal Harriett*, 32*s.*-34*s.*

East Russell shares have declined 1*l.* from their last-mentioned prices of 4*½l.*-5*l.*, and close dull at 3*½l.*-4*l.* *Drakevalls*, 36*s.*-38*s.* *Wheal Crebor*, 2*½l.*-2*¾l.* *Lady Bertha*, 15*s.*-17*s.* 6*d.* *Kelly Bray*, 5*s.*-7*s.* 6*d.* *New Wheal Martha*, 1*l.*-1*½l.* *Hingston Down*, 4*½l.*-4*¾l.* *Gawton*, 15*s.*-17*s.* 6*d.*

In Welsh and other mines prices have been quoted as follows:—*Bryn Gwog*, 34*l.*-36*l.* *Central Minera*, 2*l.*-2*½l.* *Prince of Wales*, 5*s.*-7*s.* 6*d.* *Rhymney Iron*, 49*l.* x. d. *Rhymney Iron New*, 7*½l.* x. d. *Bryntail*, 2*½l.*-3*l.* *Great Laxey*, 2*½l.*-5*½l.*

Among foreign and colonial mines, transactions have been reported principally as follows:—*St. John Del Rey* shares have suffered a decline during the past month. They opened at 51*l.* on the 1st, and went down gradually to their present quotation of 44*l.*-46*l.* *Cape Copper* shares have been dealt in at from 10*l.*-10*½l.* to 12*½l.* *Cobre Copper* shares have been quoted at 33*l.*-34*½l.* *Yudanamutana*, 3*½l.*-3*¾l.* *Fortuna*, 3*¾l.* *United Mexican*, 7*l.* *Panulcillo*, 2*½l.* *Worthing*, 17*s.* 6*d.* *Don Pedro North Del Rey*, 15*s.*-17*s.* 6*d.* *Santa Barbara*, 10*s.* *Port Phillip*, 1*½l.*-1*¾l.* *Copiapo*, 5*½l.* *English and Australian Copper*, 1*¾l.* *East del Rey*, 17*s.* 6*d.* *Kapunda*, 1*½l.*-1*¾l.* *Pontigbaud*, 7*l.* *Montes Aureos*, 2*½l.* *Peel River Land and Mineral*, 47*l.* *Alamillos*, 17*s.* 6*d.* *Anglo-Mexican Mint*, 21*½l.* *Linares*, 7*l.* *Quebrada Land and Mining*, 3*½l.*-3*l.* *Mariquita*, 12*s.* 6*d.* *Nova Scotia Gold and Land*, 1*½l.*-1*¾l.* *Nerbudda Coal and Iron*, 5*½l.*

Among new undertakings this month, *United Merthyr Collieries* have been quoted at 1*½l.*-2*l.* prem. *British Copper*, 10*s.*-15*s.* prem. *Rossa Grande*, 5*s.*-10*s.* prem. *Gellivara*, 10*s.*-25*s.* prem. *Cleveland Iron*, 1*l.*-2*l.* prem. *Frontino and Bolivia*, 1*l.*-1*½l.* prem.

CORNWALL.—The Cornish mining share market has been characterised by great briskness during the past month, notwithstanding the drop in the standards. *East Caradon* shares have not been quite so much dealt in, and have been quoted at 31*l.*-32*l.* *Great Wheal Fortune* shares have been more in demand, and rose at one time to 18*½l.*, but close at 14*l.*-16*l.* *East Carn Brez* shares, 7*l.* *Nanjiles* shares have been flatter at 30*l.* *North Crofty*, 4*½l.* *Wheal Seton*, in demand at 200*l.* *Great Wheal Vor*, 38*l.*-40*l.* *New Rosewarne*, 12*l.*

BIRMINGHAM.—*Muntz's Metal* shares were last quoted at 11*s.* 6*d.* dis.

MANCHESTER.—*Gartell Gold*, 2*s.* 6*d.* dis.

NEWCASTLE-ON-TYNE.—There has been a fair amount of activity in the mining market. *Chiverton*, *West Chiverton*, *Chiverton Moor*, *Copper Hill*, *Chiverton Valley*, and *Wentworth Consols* shares have been dealt in.

DUBLIN.—There was a considerable amount of firmness in the Irish mining share market until towards the close of the month, when it became dull. *Mining Company of Ireland* shares have been in request, at prices varying from 23*½l.*-23*¾l.* *General Mining Company of Ireland* shares have been dealt in at 4*½l.*-4*¾l.* *Carysfort*, 18*s.* 6*d.* *Connorree* shares have been rather dull, but close better at 19*s.* *Wicklow Copper* shares have been in request at 12*l.*-15*l.*

NEW YORK, March 7th.—In the mining share market the following have been the principal fluctuations—**ADVANCED:** *Central*, \$2; *Canada*, \$4; *Columbian*, \$2; *Evergreen Bluff*, \$2; *Hamilton*, \$2; *Mandan*, \$2; *Mine*

sota, \$10; *Quincy*, \$2; *Rockland*, \$4. DECLINED: *Bohemian*, \$½; *Flint Steel River*, \$1; *New York and Nova Scotia Gold* \$1½. The following are the closing quotations: *Aztec*, \$4½-\$5; *Bedford*, \$4½-\$4½; *Bohemian*, \$9½; *Boston*, \$6½-\$6½; *Bucks Co.*, \$1-\$1½; *Caledonia*, \$7-\$8½; *Canada*, \$6-\$7; *Clute Lad*, \$1-\$2½; *Copake Iron*, \$11-\$13½; *Carp Lake*, \$3½-\$5; *Central*, \$60-\$60½; *Columbian*, \$9½-\$10; *Erie Lead*, \$15-\$22; *Evergreen Bluff*, \$10½-\$12; *Everett*, \$2-\$4; *Eureka*, \$1½-\$2; *Flint Steel River*, \$8½-\$9; *Franconia*, \$2½; *Grand Portage*, \$30-\$40; *Hilton*, \$4½-\$5; *Hamilton*, \$6½-\$7; *Huron*, \$36; *Indiana*, \$6-\$6½; *Isle Royal*, \$25-\$27; *Knowlton*, \$8-\$8½; *Lafayette*, \$1½-\$2; *Lancaster Lead*, \$½-\$1; *Manhattan* (asst. paid) \$6½-\$7½; *Mandan*, \$5-\$7; *Minnesota*, \$86½-\$88; *Montana Gold*, \$½-\$1; *New York*, \$1-\$1½; *N. J. Consolidated*, \$6½-\$7; *Norwich*, \$5-\$6; *New York and Nova Scotia Gold*, \$1½-\$2½; *Ontonagon Copper*, \$3½-\$3½; *Providence*, \$1½-\$2½; *Placencia Bay Lead*, \$1½-\$2; *Quartz Hill Gold*, \$13-\$16; *Quincy Copper*, \$89-\$91; *Reliance do.*, \$4½-\$6; *Rockland do.* (asst. paid), \$17½-\$19; *Saginaw Salt*, \$25; *Sussex Lead*, \$½-\$1½; *Teal Lake Iron*, \$6; *Vermont Copper*, \$1-\$2½. [* * American Gold, \$161½.]

SAN FRANCISCO, *February 6th.*—Although the mining share market has been rather quiet, yet a large amount of business has been transacted, prices having been well sustained, though without any great fluctuations. The shares principally dealt in have been *Lady Bryan*, *North Potosi*, *Chollar*, and *Gould and Curry*.

Lady Bryan has again become the chief speculative stock; shares have been largely dealt in at improved rates, and it is reported that half of the entire number has changed hands at from \$60 to \$70, near double our closing quotation of last month. *North Potosi* has come greatly into favour, a large number of shares having changed hands at improved rates. Prices at one time rose to \$75, but close at \$65. *Gould and Curry* shares have slightly declined from our last quotation, closing at \$4,950. A dividend of \$126 per foot has been declared. *Chollar* shares have considerably improved, and a large business has been transacted in them. Prices have been as high as \$400, but close slightly lower at \$370. *Burning Moscow* shares have continued to decline all through the month, the closing quotation being \$105. *Savage* shares have been considerably dealt in, and have largely advanced from our last quotation, shares having changed hands at from \$3,325 to \$3,375. A dividend of \$50 per foot has been declared. *Ophir* shares have fluctuated between \$1,490 and \$1,550. A large business has been transacted in *North American* shares, and prices have advanced from \$85 to \$117½. *Hale and Norcross*, \$1,550. *Baltic*, \$165 to \$170. *Melones*, \$60 to \$65.

METAL MARKETS.

LONDON, *March 29th.*—The metal market has not yet shown any signs of recovering its former activity, and has been very dull all through the past month: prices generally tending downwards.

IRON.—The market for this metal has been flat, orders having been kept back in hopes of a reduction.

The Scotch pig-iron market opened quiet at 58s. 9d. cash, and gradually declined till the 10th, when prices were quoted as low as 56s. After that date prices took an upward tendency, and about the middle of the month there was a decided improvement, and a fair amount of business was done; prices close at 58s. 3d. cash, 59s. 6d. three months open.

In Welsh bars there has been little doing, and prices close at 8l. f.o.b. in Wales. Staffordshire descriptions have been in moderate request. Swedish iron has been firmly maintained.

COPPER.—In the early part of the month the market for this metal was

very dull, and a reduction of 5*l.* took place on March 1st, and again on the 9th. At the close of the month sales could with difficulty be effected, and second-hand parcels were to be obtained below official prices. Burra Burra, 105*l.* Kapunda, 106*l.* Chili, 92*l.*

TIN.—The market for this metal has been very flat, and on the 17th a fall of 4*l.* was announced, since which however the market has been firmer. Straits have been in demand at 112*l.* Banca, 116*l.* to 117*l.* The Dutch market has been quiet at 68½ *fl.*

TIN PLATES have been in fair demand at full prices.

LEAD.—This metal has shown great firmness. Common English, 21¾ *l.* L. B., 22*l.* W. B., 22¾-22¾ *l.*

SPELTER.—The activity which prevailed in this metal at the end of last month has subsided, and very little business has lately been done in it. Hull parcels, 21*l.* 10*s.* to 21*l.* 15*s.*

GLASGOW, March 29th. IRON.—A fair business has been done in Scotch pig-iron, though the market has not yet recovered its tone. It opened firm on the 27th at 58*s.* 6*d.*, No. 1, buyers; sellers, 59*s.* Warrants, buyers, 59*s.* 3*d.*; sellers, 59*s.* 4½*d.*; No. 3, sellers, 57*s.*; buyers, 58*s.* Market then became flat till the 3rd, after which though quiet, it continued steady until the 10th at prices varying from 56*s.* 3*d.* to 57*s.* 9*d.* cash. Prices then became firmer and advanced almost daily until the 16th, on which date the market opened strong at 59*s.*, but by the close of the day fell to 58*s.* 1½*d.* cash paid. From that time to the end of the month there have been several fluctuations, and closing rates are reported at 58*s.* 1½*d.* cash; sellers, 58*s.* 3*d.*, and at 59*s.* 6*d.* three months open. No. 1, G. M. B., 57*s.* 9*d.*; No. 3, 57*s.* 3*d.*

PARIS, March 28th. COPPER.—The market for this metal has been somewhat firmer, although prices have been reduced. English, 260 *fr.* Lake Superior, 315 *fr.* Chili, 240 *fr.*

TIN remains unaltered.

SPELTER.—This article has been in less demand at 58½ *fr.* to 59 *fr.*

COLOGNE, March 24th. IRON.—A fair business has been done in this metal, and prices have shown an upward tendency.

AMSTERDAM, March 24th.—**COPPER** has been firmer, and prices more favourable.

TIN.—Banca has been held firmly at 69 *fl.*

BRESLAU, March 24th. SPELTER.—The market for this article remains inactive, and no business doing.

HAMBURG, March 24th.—The metal market has been quiet during the past month, although prices generally have been well maintained.

IRON.—Scotch pig, 2¾ *mk.* to 2½ *mk.* English, in bars, 6½ *mk.* to 6¾ *mk.* Staffordshire descriptions, 7½ *mk.* to 7¾ *mk.*

COPPER.—The reduction of prices in England has had its effect here; prices have receded and little business has been done. English in blocks, 68 *mk.*

TIN remains neglected and prices quite nominal. Banca, 13 *mk.* to 13½ *mk.*

SPELTER.—There has been little business done in this article, and prices remain at 14 *mk.*

HONGKONG, February 1st. LEAD.—450 pigs sold; common, \$6.30 to \$6.40; best, \$6.70 to \$6.80.

IRON.—Nail rod, \$2.70; hoop, \$3 to \$3.20; bar, \$2.50 to \$2.60; Swedish, \$4 to \$4.40.

Furnished by Von Dadelsen and North, 158, Leadenhall Street, London, E.C.

The metal market during the month of March has been in a very depressed state, prices tending in buyers' favour. We cannot anticipate a rise until there are more favourable features in politics. Operators and consumers use the greatest caution.

IRON.—Welsh bars have been very quiet at nominally 8*l.* f.o.b. Wales. The meeting to be held in Birmingham on the 31st will decide prices for Staffordshire descriptions (which have been in fair demand) during the next quarter. Scotch pig iron during the early part of the month fell to 56*s.* 6*d.* cash, and 58*s.* open; there is however a fair amount of business doing at 58*s.* 3*d.* cash, 59*s.* 6*d.* three months open.

COPPER.—On the 1st instant the smelters reduced the price of copper 5*l.*, and again on the 9th. The sales of English have been difficult. Second-hand parcels obtainable fully 3*l.* below official prices. Some transactions have been reported in Burra at 105*l.* Kapunda is held for 106*l.*, and Chili 92*l.*

TIN.—English was reduced on the 17th 4*l.* per ton all round, since which however the market has been firmer. We quote Banca 116*l.* to 117*l.* Straits, 112*l.* The Dutch market dull at 68½ *fl.*

TIN PLATES have been in fair demand.

LEAD very firm.

SPELTER.—This metal has assumed a downward tendency, imports being large and the demand very light. We quote prices 21*l.* 15*s.* and 21*l.* 10*s.* spot, for forward delivery from 21*l.* 15*s.* down to 21*l.* 5*s.* Hull spelter, 21*l.* 12*s.* 6*d.*

QUICKSILVER, 9*l.* 5*s.*

THE BOARD OF TRADE RETURNS.

The "Accounts relating to Trade and Navigation of the United Kingdom, for the month ended 31st January, 1864," have been issued by the Statistical Department, Board of Trade.

IMPORTS.—The quantities and relative increase and decrease of the imports of metals, metallic ores, and mineral products, for the month ended 31st January, have been as follows:—

	Month ended 31st January.		
	1863.	1864.	Increase (+) or Decrease (—)
Brimstone cwt.	17,418	12,639	— 4,779
Copper Ore tons	4,238	4,491	+ 153
Copper Regulus "	2,176	2,027	— 149
Copper, unwrought and part wrought cwt.	3,180	7,280	+ 4,100
Iron, in Bars, unwrought tons	521	2,171	+ 1,650
Steel, unwrought "	13	443	+ 430
Lead, Pig and Sheet "	612	636	+ 24
Spelter or Zinc "	726	1,192	+ 466
Silver Ore value in £	8,050	900	— 7,150
Petroleum tuns	497	43	— 454
Pyrites tons	2,742	2,912	+ 170

EXPORTS.—The quantities, declared value, and relative increase and decrease of the exports of metals, minerals, and metallurgical articles of British and Irish produce and manufactures, for the month ended 31st January, have been as follows:—

	QUANTITIES.		DECLARED VALUE.		
	Month ended 31st January.		Month ended 31st January.		
	1863.	1864.	1863.	1864.	Increase (+) or Decrease (-).
Alkali: Soda	124,703	121,205	£ 51,219	£ 51,496	£ 277
Coal, Cinders, and Culm	454,784	568,851	217,463	270,160	+ 52,697
Iron, Pig and Puddled	26,799	20,099	73,301	62,011	- 11,290
Iron, Bar, Angle, Bolt, and Rod	20,991	20,874	153,062	181,444	+ 28,382
Iron, Railroad, of all sorts	22,685	26,836	161,148	193,415	+ 32,267
Iron, Cast	4,979	2,607	38,303	26,624	- 11,679
Iron Hoops, Sheets, and Boiler Plates	6,445	8,119	60,399	109,176	+ 48,777
Iron, wrought, of all sorts	6,488	4,863	132,361	104,715	- 27,646
Iron, Old, for remanufacture	579	159	2,051	645	- 1,406
Iron, Steel, unwrought	1,729	2,197	53,905	68,577	+ 14,672
Copper, unwrought, in Ingots, Cakes, or Slabs	5,568	9,173	26,985	46,567	+ 19,582
Copper, wrought or partly wrought, Bar, Rods, Bottoms, Pans, Plates, Sheets, and Nails; and mixed or Yellow Metal for Sheathing	19,636	33,323	94,755	170,936	+ 76,181
Copper, wrought, of other sorts	594	578	3,372	3,912	+ 540
Brass of all sorts	2,009	1,722	10,616	9,642	- 974
Lead, Pig, Rolled, Sheet, Piping, Tubing, and Lead Shot	1,694	2,004	37,090	44,067	+ 6,977
Lead Ore, Lead, Red and White, and Litharge of Lead	248	282	6,403	7,406	+ 1,003
Salt	20,517	27,662	9,953	14,216	+ 4,263
Tin, unwrought	4,512	8,735	26,051	49,802	+ 23,751
Tin Plates	60,752	60,601	71,155	74,553	+ 3,398
Zinc or Spelter, wrought or unwrought	5,086	9,331	5,410	9,309	+ 3,959
			1,235,002	1,498,733	+ 263,731

LONDON PRICES CURRENT OF METALS.

From Messrs. JAMES and SHAKSPERE'S, 10, Austin Friars, E.C., 29th March.

		Per Ton.	
IRON	Rails	in Wales ..	£7 15 0 @ £8 0 0
Welch	Bars	" ..	" 7 15 0
	"	" ..	" 9 0 0
	"	" ..	" 10 10 0
Staffordshire ..	Nail Rods	" ..	" 10 10 0
	Hoops	" ..	" 11 10 0
	Sheets	" ..	" 12 10 0
Scotch	Pig (mixed Nos. warrants) in the Clyde	" ..	" 2 18 0
	"	" ..	" 2 18 3
Swedish	Iron { Large sizes	" ..	" 12 10 0
	" { Indian assortments ..	" ..	" 12 10 0
Hammered ..	Steel { Faggot	" ..	" 17 0 0
	" { In kegs ($\frac{1}{4}$ and $\frac{3}{8}$ in.) ..	" ..	" 16 0 0
		Per Unit.	
COPPER	Ore	18s. 0d. @	—
	Regulus	18s. 3d. "	—
	Barilla	19s. 6d. "	—
		Per Ton.	
	Chili Slab (for 96% pure Copper)	—	none
	Spanish Cake	£97 0 0 @ £	—
Australian ..	Burra and P.C.C.	105 0 0 "	—
	Kapunda	106 0 0 "	—
	Walleroo	105 0 0 "	—
American....	Baltimore	—	none
	Lake Superior	—	—
	Tough Cake and Ingot and Tile	—	@ 103 0 0
English	Best selected Ingot	—	" 106 0 0
	Sheets, Sheathing and Rod	—	" 110 0 0
	Flat Bottoms	—	" 115 0 0
		Per lb.	
YELLOW METAL..	Sheets	8 $\frac{1}{2}$ d. @	9d.
	Sheathing and Rod	9 $\frac{1}{2}$ d. "	9 $\frac{3}{4}$ d.
		Per Cwt.	
TIN	Common Blocks and Ingots	111s. @	112s.
English ..	" Bars (in barrels)	112s. "	113s.
	Refined	—	" 117s.
	Straits, Fine	—	" 112s.
Foreign ..	" (with 3 months' prompt) ..	—	" 114s.
	Banca	115s. "	116s.
		Per Box.	
TIN PLATES	Charcoal IC, best	3Cs. 6d. @	31s. 6d.
	" IX "	31s. 6d. "	37s. 6d.
	Coke IC	25s. 0d. "	27s. 0d.
	" IX	31s. 0d. "	33s. 0d.
		Per Ton.	
LEAD.....	Sheet	£21 17 6 @	£22 0 0
English ..	Pig—W.B.	—	" 22 12 6
	" Other good brands	21 17 6 "	" 22 0 0
Foreign ..	" German and Spanish, soft ..	—	" 21 0 0
	Red	—	" 22 0 0
English ..	Shot	—	" 24 0 0
	Dry White	—	" 26 0 0
SPELTER	(Silesian) in Cakes	21 15 0 "	—
ZINC	(Sheet) No. 9 and upwards	—	" 26 10 0
		Per Bottle.	
QUICKSILVER (in bottles containing 75lbs. each)		9 0 0 @	9 5 0
		Per Ton.	
REGULUS OF ANTIMONY, French Star		—	@ 38 0 0

Tabular Abstract of Mining Accounts for the Month.

Date of Month.	Name of Mine, and Number of Shares.	Balances.				Calls.				Dividends.			
		Debit.		Credit.		Per Share.		Total.		Per Share.		Total.	
		£	s.	d.	£	s.	d.	£	s.	d.	£	s.	d.
b. 17	CORNISH & DEVON MINES.												
17	Botallack (200)	—	—	—	2,162	11	4	—	—	—	5	0	0
17	Gawton (4,000)	—	—	—	51	15	10	0	1	0	200	0	0
18	North Buller (1,024)	269	1	3	—	—	—	0	12	6	640	0	0
18	Falmouth & Sperris (2,000)	2,738	10	9	—	—	—	1	0	0	2,000	0	0
18	Sithney & Carnmeal (2,048)	2,135	16	1	—	—	—	1	1	0	2,150	8	0
19	Wheal Owles (80)	—	—	—	2,012	2	11	—	—	—	5	0	0
19	Cargoll (916)	—	—	—	1,014	7	2	—	—	—	1	5	0
22	Wheal Tremayne (2,044)	—	—	—	398	16	9	—	—	—	—	—	—
22	Camborne Vein (4,600)	566	0	0	—	—	—	0	10	0	2,300	0	0
23	Great Work Consols (119)	—	—	—	1,125	7	11	—	—	—	5	0	0
23	East Carn Brea (6,000)	—	—	—	571	19	8	—	—	—	—	595	0
23	South Carn Brea (6,000)	1,373	13	8	—	—	—	0	6	0	1,500	0	0
23	Gurlyn (4,910)	1,168	18	9	—	—	—	0	4	8	1,145	13	4
23	Wheal Union (6,000)	491	10	1	—	—	—	0	5	0	1,500	0	0
24	Providence (1,120)	—	—	—	2,099	3	11	—	—	—	1	5	0
24	Rosewarne Consols (4,026)	439	0	0	—	—	—	0	2	6	503	5	0
24	Wheal Margaret (896)	313	4	6	—	—	—	1	10	0	9,000	0	0
24	North Basset (6,000)	120	18	6	—	—	—	—	—	—	—	—	—
24	Great Fortune (1,798)	—	—	—	818	18	4	—	—	—	—	—	—
24	Boscawell (1,248)	—	—	—	552	14	0	—	—	—	0	5	0
25	Wheal Par (1,024)	—	—	—	—	—	—	0	10	0	512	0	0
25	Charlotte United (6,000)	—	—	—	—	—	—	0	5	6	1,650	0	0
25	Cuddra (6,000)	620	2	8	—	—	—	0	3	0	900	0	0
25	Kelly Bray (5,000)	715	2	10	—	—	—	0	4	0	1,000	0	0
26	Trevenen and Trevenhere (5,600)	800	0	0	—	—	—	0	3	0	840	0	0
26	Wheal Grenville (6,000)	2,026	12	0	—	—	—	0	7	0	2,100	0	0
26	Prosper United (6,000)	258	15	11	—	—	—	—	—	—	—	—	—
29	East Pool (128)	—	—	—	1,289	11	1	—	—	—	7	10	0
29	Wheal Rose (2,000)	576	2	9	—	—	—	—	—	—	—	960	0
29	Rosewarne United (3,848)	—	—	—	72	19	0	—	—	—	—	—	—
far. 1	Wheal Jane (512)	—	—	—	554	8	8	—	—	—	0	10	0
1	Penden Consols (5,000)	43	19	10	—	—	—	—	—	—	—	—	—
1	Yarner (3,097)	524	2	6	—	—	—	0	2	6	387	2	6
1	Eather United (6,144)	115	0	0	—	—	—	0	0	6	153	12	0
2	West Sharp Tor (256)	—	—	—	271	8	11	3	0	0	768	0	0
2	Condurow (256)	6,986	16	1	—	—	—	—	—	—	—	—	—
2	Fowey Consols (940)	—	—	—	1,302	0	0	—	—	—	—	—	—
2	Trelyon Consols (572)	306	17	6	—	—	—	—	—	—	—	—	—
2	Leeds & St. Aubyn (1,019)	—	—	—	57	9	2	—	—	—	—	—	—
3	East Chiverton (2,000)	—	—	—	28	6	9	0	6	0	600	0	0
7	South Frances (496)	—	—	—	1,093	12	1	—	—	—	—	—	—
8	Wheal Mary Ann (1,024)	—	—	—	1,803	1	9	—	—	—	0	10	0
8	Carn Brea (1,000)	—	—	—	6,163	0	0	—	—	—	—	—	—
8	Crane (861)	685	14	9	—	—	—	1	0	0	861	0	0
8	Grambler & St. Aubyn (486)	319	11	4	—	—	—	1	0	0	486	0	0
9	Wheal Sparrow (6,000)	—	—	—	313	3	8	—	—	—	—	—	—
9	Pedn-an-drea (8,465)	1,388	2	0	—	—	—	0	2	6	1,058	2	6
10	Wheal Curtis (1,000)	2,616	9	6	—	—	—	1	10	0	1,500	0	0
11	St. Day United (4,000)	—	—	—	2,089	11	8	—	—	—	0	5	0
11	West Great Work (4,216)	430	0	0	—	—	—	0	4	0	843	4	0
12	East Treskerby (1,024)	13	8	9	—	—	—	0	6	0	307	4	0
14	West Damsel (256)	—	—	—	—	—	—	—	—	—	1	0	0
15	North Roskear (700)	1,762	3	10	—	—	—	2	0	0	1,400	0	0
15	Roskearnoweth (700)	—	—	—	179	2	10	—	—	—	—	—	—
15	Wheal Buller (256)	350	6	9	—	—	—	3	0	0	768	0	0
15	Tincroft (6,000)	—	—	—	3,472	7	4	—	—	—	0	10	0
16	Great Wheal Vor (6,908)	—	—	—	5,954	0	0	—	—	—	0	10	0
16	Wheal Uny (4,096)	—	—	—	1,251	11	3	—	—	—	—	—	—
16	Cardon Vale (10,000)	—	—	—	1,804	17	7	—	—	—	—	—	—
16	Spearn Moor (280)	243	15	0	—	—	—	—	—	—	—	—	—
18	Carnyorth (2,048)	878	1	4	—	—	—	—	—	—	—	—	—
18	New Treleigh (6,000)	2,015	0	0	—	—	—	0	4	0	1,200	0	0
19	North Levant (2,000)	2,376	14	11	—	—	—	1	0	0	2,000	0	0
	WELSH & OTHER MINES.												
an. 29	Alderly Edge (1,200)	—	—	—	1,042	0	9	—	—	—	0	15	0
eb. 5	Miners (1,800)	—	—	—	13,179	0	0	—	—	—	7	0	0
25	Vigra and Clogau (4,200)	562	0	0	—	—	—	—	—	—	—	—	—
far. 3	Bryntall (1,832)	264	6	6	—	—	—	0	3	0	274	16	0
7	Cardigan Consols (10,000)	—	—	—	1,156	0	0	—	—	—	—	—	—
9	Great Laxey (12,500)	—	—	—	7,232	0	0	—	—	—	0	6	0
10	North Laxey (6,000)	—	—	—	116	1	2	—	—	—	—	3,750	0
	FOREIGN MINE.												
far. 10	Yudanamutana (45,000)	—	—	—	159,681	0	0	—	—	—	—	—	—

Copper Ores.

Sampled Feb. 10, and sold at Tabb's Hotel, Redruth, Feb. 25.

Mines.	Tons.	Pur- chasers.	Price.	Mines.	Tons.	Pur- chasers.	Price.
South Caradon	80	9	£8 17 8	Clifford Amalgamated	16	1	£5 7 6
77	1, 3	8 6 8		Tywarnhaile	62	6, 12	2 2 0
65	3	8 0 8		54	6	6 9 0	
64	7	5 18 0		53	4, 6, 7	2 17 8	
55	3	16 10 6		48	4, 6	2 16 8	
54	2, 5	17 14 0		46	4, 6	2 4 0	
34	3, 7	6 16 6		42	3, 7	2 4 6	
81	7	6 12 6		41	3	7 4 0	
Great Wheal Busy.....	89	4, 6	3 11 6	Fowey Consols	32	3	3 4 6
82	4, 6	5 0 0		83	1, 5	5 5 6	
86	12	2 12 6		72	1	7 9 6	
60	1, 12	1 10 6		55	1, 5	6 0 6	
55	4, 6	4 6 6		Craddock Moor	86	4, 6	7 5 0
40	1	4 0 0		53	6	9 9 6	
38	12	2 9 0		44	2	7 8 6	
26	2	6 16 0		63	1	5 8 6	
Phoenix Mines	85	1	3 8 0	Great North Downs ...	63	9	5 8 6
84	6	3 10 6		49	3	7 13 6	
90	5	4 1 0		Boscawen.....	55	7	3 19 6
76	6, 9	3 2 0		28	1, 3, 5	9 9 0	
59	1	3 9 6		Nanjiles	38	3	6 6 6
26	1	9 19 0		27	8	3 14 6	
West Damsel	79	7	5 1 0	Caradon United.....	63	1	2 1 6
74	7	4 15 6		East Wheal Ellen	50	5, 13	4 15 0
64	7	5 8 6		North Grambler.....	25	1, 5	6 4 6
63	2, 3	4 8 6		13	3	0 10 0	
62	7	4 12 6		Falmouth & Sperries	32	1, 5	2 15 6
49	7	4 4 6		Great Brigan	25	2	6 14 6
Clifford Amalgamated	74	10, 12	0 6 0	Grambler & St. Aubyn	11	1	8 1 6
63	10	2 14 0		Mary Great Consols ...	7	12	1 6 0
62	12	1 14 6		Creegbrowse	6	3	4 1 6
55	5	2 17 0		Barrett's Precipitate ..	2	1	45 0 0
43	2	4 2 0		Ninnis's Precipitate ..	2	1	45 0 0
31	3	6 8 6		Clarke's Precipitate ..	2	5	36 5 0
22	2	8 9 0		Aver's Precipitate	1	5	34 17 0
21	1, 5	3 10 6		Oliver's Ore	1	12	8 16 0

TOTAL PRODUCE AND VALUE.

	Tons.	Amount.		Tons.	Amount
South Caradon	470	£4,457 5 0	East Wheal Ellen	50	£237 10 0
Great Wheal Busy	457	1,663 8 0	North Grambler	35	143 9 0
Phoenix	410	1,608 8 6	Falmouth and Sperries	32	88 16 0
West Damsel	391	1,872 1 0	Great Brigan	25	167 10 0
Clifford Amalgamated	387	1,177 8 0	Grambler and St. Aubyn ...	11	88 16 6
Tywarnhaile	372	1,349 4 0	Mary Great Consols	7	9 2 0
Fowey Consols	210	1,307 8 0	Creegbrowse.....	6	24 9 6
Craddock Moor	177	1,324 5 6	Barrett's Precipitate	2	90 0 0
Great North Downs	112	717 17 0	Ninnis's Precipitate	2	90 0 0
Boscawen	83	493 4 6	Clarke's Precipitate	2	72 10 6
Nanjiles	65	339 19 6	Aver's Precipitate	1	34 17 0
Caradon United.....	63	130 14 6	Oliver's Ore	1	8 16 0

EACH COMPANY'S PURCHASE.

	Tons.	Amount.		Tons.	Amount.
1 Vivian and Sons	584½	£3,012 18 0	9 Copper Miners' Co.....	191	£1,078 6 6
2 Freeman and Co.....	218½	1,650 9 9	10 Charles Lambert	100	181 4 6
3 Grenfell and Sons	409½	3,144 0 6	11 Newton, Keates & Co. ...	—	—
4 Crown Copper Co.*	—	—	12 Sweetland, Tuttle & Co. 273	—	615 12 0
5 Sims, Williams & Co. 343½	—	2,046 16 9	13 Penclawdd Copper Co. 25	—	118 15 0
6 Williams, Foster & Co. 668½	—	3,030 0 6			
7 Mason and Elkington ... 533½	—	2,607 19 6	Total	3,374	£17,496 14 9
8 Bankart and Sons	27	100 11 6			

Average Produce, 6.

Quantity of Fine Copper, 201 tons 19 cwt.

Average Standard

Average Price per ton

* The purchases made by No. 4 (Crown Copper Co.) are included in the total of No. 6 (Williams, Foster & Co.), those firms being identical.

Copper Pres.

Sampled Feb. 17, and sold at Tabb's Hotel, Bedruth, Mar. 3.

Mines.	Tons.	Pur- chasers.	Price.	Mines.	Tons.	Pur- chasers.	Price.
Clifford Amalgamated	101	1, 6	£5 8 6	East Pool.....	75	6	£5 1 0
	96	7	4 8 0		65	2	4 14 6
	82	6, 9	4 6 0		51	9	5 4 0
	66	2	4 1 0	Tolcarne	52	5	3 18 0
	64	3	11 14 6		49	5	4 6 0
	63	3	11 13 0		36	1	2 10 6
	62	3	12 3 0		33	5	2 13 0
	57	2, 7	4 12 6	North Roakear	40	7	9 2 0
	56	3	5 3 0		32	5	6 6 6
	53	1	2 18 6		23	10	2 4 6
	50	1	10 1 6	(Pendarves) 33	7		5 17 0
West Seton	77	4, 6	7 2 0	Wheal Basset	59	5	4 12 6
	69	1, 3, 7	6 19 0		43	13	5 3 6
	66	7	4 19 0		20	5	9 7 0
	56	9	5 13 0	New Treleigh	65	2, 9	3 13 0
	58	7	5 1 6		55	4, 6, 12	2 5 0
	48	9	2 13 0	South Frances	34	5	5 3 0
	44	1	6 2 6		32	5, 6	5 10 0
	41	7	9 19 0		27	6	10 16 6
	30	1	0 18 6		24	5	8 17 0
Wheal Seton	90	2, 6	5 7 6	East Basset	48	1	6 16 6
	70	6	6 4 0		35	1	9 8 6
	63	5	0 8 6		31	1	6 18 6
	60	6	6 10 0	Tresavean	47	3	2 2 6
	17	3, 12	1 11 6		2	12	2 18 6
	10	3	16 14 6		1	1	9 10 0
	6	5	2 5 0	West Stray Park.....	32	1	7 0 6
South Tolgus	50	4, 6	5 2 6	Wheal Crofty	22	2	4 10 0
	56	13	7 9 6		9	2	2 1 6
	54	10	3 18 6	Crane	10	1	9 4 6
	51	1	9 14 6		4	7	14 17 0
	49	5, 9	4 4 6				

TOTAL PRODUCE AND VALUE.

	Tons.	Amount.		Tons.	Amount.
Clifford Amalgamated ...	750	£5,038 13 6	New Treleigh	120	£361 0 0
West Seton	480	2,748 11 0	South Frances	117	855 15 6
Wheal Seton	315	1,539 16 0	East Basset.....	114	872 3 0
South Tolgus	270	1,641 1 0	Tresavean	50	115 4 6
East Pool.....	191	951 1 6	West Stray Park	32	224 16 0
Tolcarne	170	591 17 0	Wheal Crofty	31	117 13 6
North Roakear	128	810 12 6	Crane	14	151 13 0
Wheal Basset	122	682 8 0			

EACH COMPANY'S PURCHASE.

	Tons.	Amount.		Tons.	Amount.
1 Vivian and Sons	494½	£3,173 1 11	9 Copper Miners' Co.....	253	£1,107 4 9
2 Freeman and Co.	268	1,184 8 3	10 Charles Lambert	77	263 2 6
3 Grenfell and Sons	333½	2,964 4 11	11 Newton, Keates & Co....	—	—
4 Crown Copper Co.* ...	—	—	12 Sweetland, Tuttle & Co. 28½	—	60 9 9
5 Sims, Williams & Co. ...	411½	1,780 5 3	13 Penclawdd Copper Co. .99	—	641 2 6
6 Williams, Foster & Co. 558½	—	3,211 17 3			
7 Mason and Elkington ...	381½	2,316 11 11	Total	2,904	£16,702 6 0
8 Bankart and Sons	—	—			

Average Produce, 6½.
Quantity of Fine Copper, 191 tons 4 cwt.

Average Standard£129 2 0
Average Price per ton 5 15 0

* The purchases made by No. 4 (Crown Copper Co.) are included in the total of No. 6 Williams, Foster & Co., those firms being identical.

Copper Ores.

Sampled Feb. 24, and sold at Tabb's Hotel, Redruth, March 10.

Mines.	Tons.	Pur- chasers.	Price.	Mines.	Tons.	Pur- chasers.	Price.
West Basset	68	9	£5 16 0	East Rosewarne	35	7	£8 12 6
63	1	9	16 6	20	3	13	10 0
55	7	4	4 6	19	2	8	5 6
45	10	3	16 0	18	9, 12	2	8 0
44	5	11	3 0	55	4, 6	7	10 6
42	1	4	2 6	53	12	4	19 0
35	2	7	4 6	Par Consols	52	3	8 10 6
Wheal Margery	77	6	2 19 6	Copper Hill	48	2, 3	5 12 6
75	5, 12	2	6 6	72	12	1	18 6
55	1, 6	7	9 6	13	6	6	17 0
52	1, 6	8	1 0	Wheal Buller	56	2, 6	3 13 9
49	1	4	1 6	Wheal Curtis	33	5	4 4 0
Prosper United	111	5	3 1 6	22	1	1	11 6
99	1	2	5 6	Crowan Consols	24	7	2 5 0
42	2	4	6 0	12	6	0	3 6
40	1, 7	3	14 6	11	1	0	4 0
East Carn Brea	64	2, 6	4 19 0	Wheal Anna	28	6	5 5 0
57	3	3	17 0	12	1	3	9 6
44	7	4	8 6	North Basset	34	1, 5	3 9 0
38	7	5	18 6	Wh. Emily Henrietta	25	1	6 14 6
36	7	5	12 6	South Crenver	19	7	1 18 0
30	9	2	12 0	4	7	6	2 6
16	3	9	10 0	West Trevelyan	14	1	5 9 6
Tolvadden	51	4, 6	4 7 0	Wheal Agar	12	1, 10	5 5 6
45	4, 6	4	13 0	Old Wheal Neptune	10	5	4 11 0
26	1	8	0 6	East Alfred Consols	5	5	2 18 6
9	7	13	17 0	Great Crinnis	1	5	31 3 6
East Rosewarne	38	7	7 4 0				

TOTAL PRODUCE AND VALUE.

	Tons.	Amount.		Tons.	Amount.
West Basset	352	£2,333 9 6	Crowan Consols	47	£58 6 0
Wheal Margery	308	1,432 17 0	Wheal Anna	40	188 14 0
Prosper United	292	896 3 0	North Basset	34	117 6 0
East Carn Brea	285	1,368 12 0	Wheal Emily Henrietta	25	168 2 6
Tolvadden	131	764 8 0	South Crenver	23	60 16 0
East Rosewarne	130	1,045 8 6	West Trevelyan	14	76 13 0
Wheal Uny	108	676 4 6	Wheal Agar	12	63 6 0
Par Consols	100	713 6 0	Old Wheal Neptune	10	45 10 0
Copper Hill	85	227 13 0	East Alfred Consols	5	14 12 6
Wheal Buller	56	205 16 0	Great Crinnis	1	31 3 6
Wheal Curtis	55	173 5 0			

EACH COMPANY'S PURCHASE.

	Tons.	Amount.		Tons.	Amount.
1 Vivian and Sons	459½	£2,328 15 3	8 Bankart and Sons	—	—
2 Freeman and Co.	180	886 10 6	9 Copper Miners' Co. ...	107	£494 0 0
3 Grenfell and Sons	169	1,219 15 0	10 Charles Lambert	51	202 13 0
4 Crown Copper Co.*	—	—	11 Newton, Keates & Co. ...	171½	509 14 9
5 Sims, Williams & Co. ...	258½	1,207 13 3	12 Sweetland, Tuttle & Co.	—	—
6 Williams, Foster & Co. ...	394½	1,988 7 3			
7 Mason and Elkington ...	322	1,744 3 0	Total	2,113	£10,681 12 0

Average Produce, 6.

Quantity of Fine Copper, 127 tons 15 cwt.

Average Standard

Average Price per ton

Blende Sales.

Dates.	Mines.	Tons	Price per ton.	Purchasers.	Amount of Money.
			£ s. d.		£ s. d.
Mar. 4. Minera	41	...	5 9 0	Vivian & Sons	624 3 0
"	55	...	5 2 0	ditto	
"	22	...	2 17 0	ditto	
"	10	...	5 15 0	ditto	
14. Great Betallack	68	...	2 3 6	W. Kenrick	147 18 0

* The purchases made by No. 4 (Crown Copper Co.) are included in the total of No. 6 (Williams, Foster & Co.), those firms being identical.

Copper Ores.

Sampled March 2, and sold at the Royal Hotel, Truro, March 17.

Mines.	Tons.	Pur- chasers.	Price.	Mines.	Tons.	Pur- chasers.	Price.
Devon Great Consols	125	1	£5 17 6	Hingston Down	83	7	£3 5 6
	124	1, 6	5 9 6		75	7	5 4 6
	122	6	5 3 0		70	3	3 2 6
	119	3	5 8 6		69	3	2 19 0
	117	2	5 15 0		50	11	10 15 0
	115	4, 6	4 14 6	Marke Valley	85	1, 5	2 7 6
	112	4, 6	5 5 0		81	12	2 11 6
	107	10	2 18 6		80	6, 12	2 6 6
	103	1	5 2 0		79	5	2 15 0
	102	1, 6	5 12 6		35	1	6 2 6
	101	1, 6	3 2 6		33	5	2 15 6
	100	7	2 7 6		24	5, 12	2 3 6
	99	6	2 17 6	East Russell	73	1, 2	3 10 0
	98	6	5 16 0		56	1, 5	3 10 0
	96	9	5 19 0		41	1	10 6 0
	76	9	4 2 6		33	13	3 15 0
	71	9	4 2 0	Bedford United	103	5	5 14 0
	65	12	1 11 0		99	5	6 7 0
	57	3	13 15 6	Wheal Emma	51	1	3 8 0
	37	9	4 17 0		46	1	3 2 6
	35	1, 5	14 1 6		43	1	6 1 6
	23	7	3 2 0		42	1	1 15 0
	15	6	6 5 6	Wheal Friendship	77	9	3 5 6
	4	1	40 0 0		66	7	9 7 0
New Wheal Martha	110	1, 5	2 11 6	Wheal Crelake	75	5	0 19 0
	105	1, 5	2 4 6		56	3	3 1 6
	104	1, 5	2 1 0	Wheal Edward	55	12	1 6 0
	100	1, 5	1 18 6		34	9	2 8 0
	75	1, 5	1 18 6		30	9	4 2 6
	70	1, 5	1 2 0	Kelly Bray	28	7	4 17 6
East Caradon	96	2, 5	5 17 0		24	12	0 17 6
	85	2	9 11 0		13	7	3 3 0
	76	12	4 6 6	Holmbush	26	7	3 4 6
	72	5	4 11 0		25	3	9 18 0
	70	6	5 10 6	Lady Bertha	40	6	2 11 6
	65	6	10 5 0	Hawkmoor	27	3, 6, 9	3 13 0
	26	3	15 0 6	Furdon	19	6	3 9 0
Hingston Down	93	3, 7	2 16 6	Collacombe	18	5	4 1 0

TOTAL PRODUCE AND VALUE.

	Tons.	Amount.		Tons.	Amount.
Devon Great Consols...	2,022	£10,362 14 6	Wheal Crelake	131	£243 9 0
New Wheal Martha	564	1,143 19 0	Wheal Edward	119	276 17 0
East Caradon	490	3,473 6 0	Kelly Bray	65	198 9 0
Hingston Down	440	1,886 4 6	Holmbush	51	331 7 0
Marke Valley	417	1,171 17 0	Lady Bertha	40	103 0 0
East Russell	203	997 11 0	Hawkmoor	27	98 11 0
Bedford United	202	1,215 15 0	Furdon	19	65 11 0
Wheal Emma	182	651 17 6	Collacombe	18	72 18 0
Wheal Friendship	143	869 5 6			

EACH COMPANY'S PURCHASE.

	Tons.	Amount.		Tons.	Amount.
1 Vivian and Sons	1,060	£4,637 6 9	9 Copper Miners' Co.	429	£1,839 13 6
2 Freeman and Co.	286½	1,893 1 0	10 Charles Lambert	107	312 19 6
3 Grenfell and Sons	477½	2,827 12 3	11 Newton, Keates & Co. ...	50	537 10 0
4 Crown Copper Co.*	—	—	12 Sweetland, Tuttle & Co. .	353	149 12 6
5 Sims, Williams & Co.	891½	3,074 2 9	13 Penclawdd Copper Co. ...	33	123 15 0
6 Williams, Foster & Co.	985	5,084 13 6			
7 Mason and Elkington	460½	1,982 5 3	Total	5,133	£23,162 12 0
8 Bankart and Sons	—	—			

Average Produce, 5½.
Quantity of Fine Copper, 282 tons 18 cwt.Average Standard £131 15 0
Average Price per ton 4 10 0

* The purchases made by No. 4 (Crown Copper Co.) are included in the total of No. 6 (Williams, Foster & Co.), those firms being identical.

Copper Ores.

Sampled Feb. 3, and sold at Swansea, Feb. 23

Mines.	Tons.	Pro-duce.	Pur-chasers.	Price.	Mines.	Tons.	Pro-duce.	Pur-chasers.	Price.
Cobre	30	13½	7	£12 7 0	Knockmahon.....	45	12	15	£11 17 0
	14	16	3.5	15 0 0		127	10½	6	10 9 0
	21	17	3	16 0 0	Ballycummiak ...	14	22½	7	22 8 0
	45	11	7	11 0 0		35	13½	7	12 14 6
	29	6½	3	6 15 0	Victor Emanuel	41	6½	7	5 0 0
	101	13	3	12 8 0		27	12½	7	11 17 0
	80	12½	3	12 4 0	Cappagh	23	10½	1, 2	10 3 6
	88	12½	6	12 1 0		14	10½	14	10 6 0
	100	13½	6, 7	12 5 0		1	43	2	41 0 0
	30	13½	5	12 2 8	Genoa.....	6	8	6	7 9 0
	56	18½	5	17 9 0	Seville	74	6½	6	5 18 0
	50	19½	1	17 4 0		70	6½	1	5 18 0
(Regulus) 49	41½	5	39	19 0 0	Cape Copper.....	44	19½	2, 7	18 18 0
	33	42	5	40 18 0		34	19½	13	18 11 6
	54	30½	3	28 10 0		23	35½	15	34 15 6
	16	14	10	16 0 8	Genoa.....	28	8½	2	7 2 6
(Precipitate) 12	60	10	62	7 8 0		17	13½	2	12 7 6
	24	12½	7	12 5 0	California	1	18	7	17 1 0
Knockmahon ...	138	9½	6	9 7 0					

TOTAL PRODUCE AND VALUE.

	Tons.	Amount.		Tons.	Amount.
Cobre	1,103	£14,104 12 0	Genoa.....	6	£44 14 0
Knockmahon	310	3,150 14 0	Seville.....	144	849 12 0
Ballycummiak	90	963 19 6	Cape Copper.....	101	2,262 19 6
Victor Emanuel	88	673 15 0	Genoa.....	45	409 17 6
Cappagh.....	38	419 4 6	California	1	17 1 0

EACH COMPANY'S PURCHASE.

	Tons.	Amount.		Tons.	Amount.
1 Copper Miners' Co.	131½	£1,390 0 3	10 Bankart and Sons	28	884 18 0
2 Freeman and Co.	79½	983 13 9	11 Charles Lambert	—	—
3 Grenfell and Sons	302	4,526 3 0	12 Ravenhead Copper Co.	—	—
4 Crown Copper Co.	—	—	13 Sweetland, Tuttle & Co. 34	631 11 0	
5 Sims, Williams & Co.	166	4,393 13 0	14 Jennings & Co.	14	144 4 0
6 Vivian and Sons	493	4,771 13 0	15 Penclawdd Copper Co. 68	1,333 1 6	
7 Williams, Foster & Co.	350	3,837 11 6			
8 British and For. Copper Co. —	—	—	Total	1,656	£22,896 9 0
9 Mason and Elkington	—	—			

Black Tin Sales.

Dates.	Mines.	Tons c. q. lbs.	Price per ton.	Purchasers.	Amount o Money.
			£ s. d.		£ s. d.
Feb. 12.	New Birch Tor	6 19 1	5 68 10 0	Williams & Co.	487 10 7
" 17.	Wheal Par	1 14 0	10 73 5 0	Redruth	124 17 0
" 20.	Penhalls	4 15 1	27 — —	—	342 9 4
"	Cuddra	4 4 3	22 — —	—	300 0 5
" 24.	St. Day United	44 8 0	27 — —	—	2,778 8 2
	Wheal Grenville.....	6 2 1	7 73 0 0	—	10,320 8 9
	"	1 2 0	10 63 0 0	—	430 10 0
	Redmoor	6 0 0	0 71 15 0	—	421 9 4
	Pendeen Consols	6 1 1	4 69 10 0	Daubuz & Co.	1,390 7 6
	Kitty (St. Agnes) ...	19 17 1	0 — —	—	258 17 0
" 25.	Gurlyn	3 14 1	27 69 10 0	Chyandour	499 9 0
	Prosper United	6 4 0	27 70 0 0	Bolitho & Sons.....	346 5 6
"	"	1 2 0	11 58 10 0	" ditto	82 4 1
" 26.	Leeds & St. Aubyn	5 0 1	14 69 0 0	" ditto	215 2 6
" 27.	North Jane	1 4 2	25 66 10 0	Daubuz & Co.	1,750 2 3½
" 29.	Pendeen Consols	3 3 3	26 67 5 0	Bolitho & Sons.....	1,519 8 0
	Drake Walls	6 15 0	0 75 0 0	Truro Co.	1,095 3 0
	"	17 5 0	0 71 12 6	Bissee Co.	410 6 11
	St. Just United	21 1 3	16 — —	—	430 6 9
Mar. 2.	Great Wheal Busy... ..	17 6 1	16 — —	—	606 2 6
" 3.	North Jane	4 8 2	25 70 0 0	W., G. & F. M. Williams	3,114 6 11
"	"	1 14 1	19 58 0 0	" ditto	
" 5.	Phoenix	7 3 1	22 60 0 0	Bissee Co.	
" 9.	North Crofty	8 12 0	0 70 12 6	—	
" 14.	Great Wheal Vor ...	43 2 3	10 — —	—	

Copper Ores.

Sampled Feb. 24, and sold at Swansea, March 15.

Mines.	Tons.	Pro-duce.	Pur-chasers.	Price.	Mines.	Tons.	Pro-duce.	Pur-chasers.	Price.
Cape Copper	87	30	11	£27 0 0	Berehaven	92	10 1/2	3, 6	£9 9 0
	86	31 1/2	5	28 10 6	Seville.....	80	5 1/2	6	4 3 0
	85	30	2	26 15 0		78	5 1/2	6	3 18 0
	84	31 1/2	5	27 7 6		28	4 1/2	6	3 11 0
	83	30	7	27 1 0	Leghorn Bulk ...	61	8 1/2	7, 13	7 12 0
	81	29 1/2	3	26 9 0		58	11 1/2	3, 7	10 10 0
	67	28 1/2	3	25 5 0		26	9 1/2	7	8 6 0
	19	37 1/2	7	33 5 0		11	10 1/2	7	9 3 0
	10	19 1/2	6	17 5 0	British Regulus...	55	14 1/2	1	12 9 0
Cuba	95	14 1/2	6	12 17 0		48	13 1/2	1	12 2 6
	90	14 1/2	6	12 17 0	French Slag	133	3 1/2	5	1 12 0
	19	77 1/2	6	12 18 0	Connorree Ore ...	40	8 1/2	1, 6	2 9 0
	88	14 1/2	6	12 18 0		40	3 1/2	6	2 9 0
	86	14 1/2	6	12 14 0	Copper Slag	77	2 1/2	5	1 5 0
	16	76 1/2	5	64 3 0	Dyfnwgwm	40	11 1/2	7	10 4 6
	85	14 1/2	5	18 0 0	Cobre	39	12 1/2	7	11 15 0
	15	73 1/2	5	61 16 0	Holyford	10	17 1/2	7	16 2 6
	52	21 1/2	3	19 18 0		1	26 1/2	7	23 15 0
	14	74 1/2	10	62 2 6	Precipitate	1	76 1/2	5	63 0 0
	8	78 1/2	10	62 15 6	Sludge Ore.....	4	21 1/2	5	19 0 0
Knockmahon ...	136	11 1/2	6	10 8 0	Lisbon	97	20 1/2	6	18 0 0
	125	10	3	8 19 0		56	27 1/2	13	23 17 6
	52	11 1/2	2	10 12 0		6	8 1/2	7	7 0 0
	149	9 1/2	3	8 5 0	Cronebane	34	3 1/2	6, 7	2 16 0
Genoa.....	7	16 1/2	7	14 15 0		13	2 1/2	14	2 1 0
	16	13	7	11 14 0		2	33	10	27 11 6
	49	9	7	8 0 0	Tigrony	2	33	10	27 5 0
	13	3 1/2	7	2 12 6	Cronebane	1	11 1/2	10	9 0 6
	3	11 1/2	7	10 4 0	Tigrony	1	11 1/2	10	9 0 6
	4	4 1/2	7	3 7 0	Bathurst	5	22 1/2	7	19 10 0
	76	9 1/2	7	8 8 0	Burnt Ore	91	5 1/2	1, 7	4 17 0
	63	9 1/2	7	8 6 6	British Regulus ..	49	26 1/2	7	23 10 0
	8	10 1/2	7	9 7 6		33	24 1/2	6	21 15 0
	2	8 1/2	7	7 12 0		16	22 1/2	6	20 3 0
Berehaven	116	10 1/2	7	9 14 0	Copper Slag	1	15 1/2	5	10 18 0

TOTAL PRODUCE AND VALUE.

Tons.	Amount.	Tons.	Amount.
Cape Copper	602	£16,269	0 0
Cuba	565	11,304	1 0
Knockmahon	462	4,313	12 0
Genoa	241	2,013	13 0
Berehaven	208	1,994	12 0
Seville Ore	186	735	12 0
Leghorn Bulk	156	1,389	1 0
British Regulus ..	201	3,458	8 0
French Slag	133	212	16 0
Connorree Ore	89	218	1 0
Copper Slag	78	108	3 0
Dyfnwgwm	40	£409	5 0
Cobre	39	458	5 0
Holyford	11	185	0 0
Precipitate	11	693	0 0
Sludge Ore	4	76	0 0
Lisbon	159	3,125	0 0
Cronebane	50	188	0 6
Tigrony	3	63	11 6
Bathurst	5	97	10 0
Burnt Ore	91	441	7 0

EACH COMPANY'S PURCHASE.

Tons.	Amount.	Tons.	Amount.
1 Copper Miners' Co.	173	£1,547	9 0
2 Freeman and Co.	85	2,273	15 0
3 P. Grenfell and Sons ...	549	7,966	4 0
4 Crown Copper Co.	—	—	—
5 Sims, Williams, & Co. ...	508	8,823	5 0
6 Vivian and Sons	1,039	12,215	16 6
7 Williams, Foster & Co. ...	768	9,480	0 6
8 British and Foreign	—	—	—
9 Mason and Elkington ...	—	—	—
10 Bankart and Sons	28	£1,499	14 0
11 Charles Lambert	87	2,349	0 0
12 Ravenhead Copper Co. ...	—	—	—
13 Sweetland, Tuttle & Co. ...	36 1/2	1,568	16 0
14 Jennings & Co.	13	26	13 0
15 Neath Copper Co.	—	—	—
Total	3,337	£47,740	13 0

Sundry Copper Ore Sales.

Dates.	Mines.	Tons. c. q.	Price per ton.	Purchasers.	Amount of Money.	
			£ s. d.		£ s. d.	
Feb. 9.	Great Laxey (ex Ruby) ...	80	0 0 ...	4 15 8 ...	St. Helen's Co.	3,199 8 4
"	"	140	0 0 ...	4 14 6 ...	Newton, Keates & Co.	
"	"	140	0 0 ...	4 9 0 ...	ditto	
"	"	130	0 0 ...	6 0 6 ...	ditto	
"	"	140	0 0 ...	5 7 0 ...	ditto	
" 10.	Lot 1 (ex J. Petronella) ...	56	0 0 ...	9 10 0 ...	J. Keys & Son	1,290 3 8
"	2	10	0 0 ...	10 5 0 ...	Vivian & Sons	
"	3 (ex J. E. Messenger) ...	10	0 0 ...	9 7 6 ...	J. Keys & Son	
"	3 (ex Phoenix)	15	0 0 ...	11 2 0 ...	Vivian & Sons	
"	4	10	10 0 ...	8 15 6 ...	J. Keys & Son	
"	5	28	0 0 ...	9 7 6 ...	ditto	
"	6 (ex N. American) ...	4	10 0 ...	2 19 0 ...	C. Lambert	
"	7	2	10 0 ...	11 0 0 ...	Vivian & Sons	
" 11.	Great Laxey (ex Fanslip) ...	40	0 0 ...	4 15 8 ...	J. Radley	191 6 8
Mar. 7.	Gawton	92	0 2 ...	—	—	295 4 11
" 15.	Parys	145	0 0 ...	7 1 6 ...	C. Lambert	2,051 15 0
"	"	145	0 0 ...	7 1 6 ...	Mona Co.	

Lead Ore Sales.

Dates.	Mines.	Tons.	Price per Ton. £ s. d.	Purchasers.	Amount of Money. £ s. d.
Feb. 22.	Iale of Man Mining Co. ...	100	23 0 6	Walker, Parker & Co.	3,940 0 0
	"	100	16 7 6	ditto	
	Dyliffe	63	14 10 6	ditto	
	"	42	14 8 6	Newton, Keates & Co.	1,520 18 6
" 25.	Hendre Ucha	14	14 16 6	Walker, Parker & Co.	207 11 0
	Bryngwyn	20	14 18 6	ditto	298 10 0
	Sunrise Hill	8	13 15 0	Newton, Keates & Co.	110 0 0
	East Pant Du	10	14 10 0	Brymbo Co.	145 0 0
	True Blue	14	14 1 0	Newton, Keates & Co.	196 0 0
	Dyliffe	44	14 16 6	A. Eyton	1,206 3 0
	"	38	14 11 6	Walker, Parker & Co.	
	Llanerchraur	18	14 17 0	Newton, Keates & Co.	267 6 0
" 29.	East Logylas	90	14 16 0	Panther Co.	1,140 0 0
	Glogfach	40	17 16 6	J. & J. Williams	713 0 0
	Cwmstwith	100	13 18 0	Sims, Williams & Co.	1,390 0 0
Mar. 1.	Maesysfa	130	14 11 6	Panther Co.	1,894 15 0
" 2.	Newtownards	60	14 11 0	Sims, Williams & Co.	873 0 0
	Minera Union	19	14 2 0	ditto	267 18 0
	Great Laxey	70	23 12 6	Stock & Co.	3,555 15 0
	"	80	23 15 6	ditto	
" 4.	Minera	100	14 16 6	Walker, Parker & Co.	
	"	100	14 16 6	ditto	
	"	100	14 17 0	Sims, Williams & Co.	
	"	100	14 17 0	ditto	
	"	100	14 17 0	ditto	9,327 9 0
	"	73	14 16 6	Walker, Parker & Co.	
	"	49	14 16 6	ditto	
	"	8	12 7 0	Newton, Keates & Co.	
" 5.	Wheal Mary Ann	50	28 15 6	Trefry's Trustees	1,880 10 0
	"	30	14 14 6	ditto	
" 10.	Talargoch (Maesyrerwddu)	434	15 3 0	Newton, Keates & Co.	659 0 6
	(Coetia Llys)	99	15 16 6	A. Eyton	1,566 13 6
	Deep Level	10	14 8 6	Newton, Keates & Co.	144 5 0
	Brynford Hall	10	14 18 6	Walker, Parker & Co.	149 5 0
	Rhodesmor	93	13 16 6	ditto	131 6 9
	Parry's	22	14 14 6	ditto	323 19 0
	Bryn Gwilog	43	15 1 6	ditto	723 12 0
	Long Rake	25	14 7 0	Newton, Keates & Co.	358 15 0
	North Henblas	10	13 5 6	Walker, Parker & Co.	
	"	10	13 10 6	ditto	267 15 0
	Pennant	10	14 2 6	Newton, Keates & Co.	141 5 0
	Chware Las	5	14 17 0	ditto	74 5 0
	Dyliffe	46	14 14 0	ditto	676 4 0
	Llangynog United	20	13 19 6	Brymbo Co.	279 10 0
	Dyfnngwm	17	14 0 6	Newton, Keates & Co.	238 8 6
	Caecronroy	10	15 5 0	Walker, Parker & Co.	152 10 0
" 14.	Frongoch	80	13 18 6	Walker, Parker & Co.	1,114 0 0
	East Darren	70	17 5 6	J. and J. Williams	1,209 5 0
	Cwm Erddin	25	17 9 0	ditto	
	"	35	17 15 6	Trefry's Trustees	1,058 7 6
" 14.	Iale of Man Mining Co. (silver ore)	100	23 18 0	Foock Works	2,863 5 0
	(chats)	30	15 15 6	Stock & Co.	
" 17.	Dyliffe	38	14 13 6	Brymbo Co.	557 13 0
" 18.	Talisker (Australia)	86	13 10 0	ditto	1,161 0 0
	Cargoll	55	17 19 0	B. Michell & Son	984 10 0
" 22.	Wheal Frank Mills	90	13 18 6	Panther Co.	1,253 5 0
" 24.	Westminster	30	14 8 6	Walker, Parker & Co.	432 15 0
	Hendre Ucha	10	14 18 6	A. Eyton	149 5 0
	Bryngwyn	18	15 3 6	ditto	273 3 0
	Pant-y-Mwyn	16	13 10 6	Walker, Parker & Co.	216 8 0
	East Pant Du	8	14 2 0	ditto	112 16 0
	Dyliffe	34	14 15 6	A. Eyton	502 7 0
	Roman Gravels	20	14 15 6	Walker, Parker & Co.	295 10 0
	Cwmbyr	18	13 14 6	ditto	247 1 0
	Dyfnngwm	144	14 2 6	Newton, Keates & Co.	204 16 3
	Llanerchraur	20	15 1 0	Walker, Parker & Co.	301 0 0

THE

MINING AND SMELTING MAGAZINE.

MAY, 1864.

The Mines and Mining Operations of Cornwall.

BY H. CURWEN SALMON, F.G.S.

THE position of the metallic miner in the ranks of industry is undoubtedly an exceptional one. His pursuit involves a greater amount of chance than almost any other regular industrial occupation, and is, at the same time, equally dependant for sustained success on a large amount of skill and experience—and skill and experience, too, of a class most difficult to define or communicate, and never efficiently acquired except by years of hard toil. From the accident of the eminently speculative nature of his pursuit it is rare for him to find his labours expand into those great individual enterprises that characterise the other branch of mining, and the kindred pursuits of metallurgy; for the experience—to judge by the practice—of almost all ages points to the prudence of dividing the risk of working a metallic mine among several persons—a system which, however necessary, has the disadvantage of creating a fluctuating constituency.

In a pursuit, therefore, where chance forms so large an element that the greatest skill cannot ensure success; and where a manager is frequently distracted by the fluctuating moods of a constantly changing body of shareholders—the holding of many of whom is not uncommonly merely temporary—often influenced by present considerations rather than the permanent benefit of the concern;—the metallic mine agent is constantly placed in conditions of anxiety and trial not easily paralleled in any other occupation, and the difficulties of which are far from being as generally appreciated as they should be.

With the labours of the metallic miner, working under these conditions, I propose to deal in these papers; which in fact will be a series of short essays on the various conditions and operations of metallic mining, illustrated by the mode of occurrence of the metallic ores and their method of working in the county of Cornwall. I prefer taking some special district as a basis rather than extending

over metallic mining generally, for I have found the extreme discursiveness into which the latter mode of treatment must necessarily lead to be practically more bewildering than instructive. And as Cornwall at the present time (whatever may have been the case formerly) is undoubtedly the classical land of metallic mining, I have selected its Mines and Mining Operations as the best existing type of metallic mining in general.

The subject naturally divides itself into two leading divisions :

I. The consideration of the conditions under which the ores sought for occur ; and

II. The methods of working them, including economical considerations.

On the first division of the subject, there exists a tolerably extensive literature, principally however scattered through the memoirs and transactions of various societies—the only complete works being Sir Henry de la Beche's "Report"* and Mr. W. J. Henwood's "Metalliferous Deposits" in Vol. V. of the Transactions of the Royal Geological Society of Cornwall.† Further on I shall have occasion to discuss the facts set forth, and the theoretical conclusions arrived at, in both these volumes ; but I may here remark that while Mr. Henwood is scrupulous in the extreme as to the accuracy of his facts, and even more so—almost to absolute negation—as to any generalisations to be drawn from them, Sir Henry, on the contrary, having taken most of his facts at second hand, is by no means a reliable authority : indeed many of his alleged facts are, as I shall show, mere local generalisations and not facts at all. Much valuable information has, I believe, from time to time been given on the metallic deposits of Cornwall by Mr. Warrington Smyth in his lectures at the Royal School of Mines, but unfortunately these have not yet been published. As Mr. Smyth has had great experience, and a wide practical connection with mining as Chief Inspector of Crown Mines and Agent for the Duchy of Cornwall, the information contained in these lectures cannot fail to be of immense value ; and it is consequently a matter of much regret that it is not made available for a wider audience than his class by their publication. Mr. Smyth's Memoirs on the Mines of Cardiganshire and Wicklow are models of what such a work should be—and they naturally induce us to "ask for more."

But on the second division of the subject—the practical working of metallic mines—we scarcely possess any modern written matter whatever. This is not a little remarkable considering the immense extent of such operations in England ; and it is a matter to be more

* Report on the Geology of Cornwall, Devon, and West Somerset. By Henry T. de la Beche, F.R.S., &c. London, Longman, 1839.

† The Metalliferous Deposits of Cornwall and Devon : with Appendices, on Subterranean Temperature ; the Electricity of Rocks and Veins ; the Quantities of Water in the Cornish Mines ; and Mining Statistics : forming Vol. V of the Transactions of the Royal Geological Society of Cornwall. By William Jory Henwood, F.R.S., F.G.S. Penzance : J. Pope Vibert. London : Longman, 1843.

regretted even than the scanty extent of our information on the mode of occurrence of metalliferous deposits, for the practice of different districts in England varies widely, and it is obviously most important that the practice of each should be compared, and their respective merits determined. On this, too, Mr. Smyth's lectures, if revised and published, could not fail to be of great value; for the practical mining community have full confidence in the soundness of his judgment, inasmuch as he has ever shown himself alive to the difficulties which beset many questions upon which less fully informed persons have been apt to dogmatise very rashly.

In these papers I shall advisedly avoid following any regular order whatever. To do so would in the first place necessitate all the matter being got together to begin with; but, besides this, it would in other respects defeat the object I have most especially in view. Each section, therefore, will be entirely independent.*

§ I.—TOPOGRAPHICAL.

The mining districts of Cornwall, among which we include those of South Devon, are naturally separable into two great divisions, that of the West and that of the East—the former lying to the west, and the latter to the east, of the town of Truro. From the Land's End, a metalliferous country extends, almost without interruption, to Kea parish, near Truro; but here a break occurs until we approach the St. Austell neighbourhood, where the metalliferous country again commences, and whence it extends, in irregular and scattered districts, to the eastern borders of Dartmoor, where it terminates in the lead mines in the neighbourhood of Chistow. These divisions are of course of very unequal extent, the Western being only about 35 miles long with a width, from sea to sea, varying from 5 to 15 miles; while the Eastern would, on my definition, extend for a length of nearly 80 miles, with an average width of fully 20 miles. But although the latter would thus show an area nearly five times as great as the former, the value of the metallic produce of the country west of Truro is about 80% greater than that of the whole of Cornwall and South Devon lying between that town and the Haldon Hills—their respective returns being, in round numbers, about as follows:—

	West Cornwall.	East Cornwall and South Devon†
	£	£
Tin ore	700,000	95,000
Copper ore	420,000	470,000†
Lead ore	50,000	100,000
Sundry ores	15,000	5,000
	1,185,000	670,000

* Some small portion of these papers will be found to have, in substance, appeared in print before in the author's contributions to other journals.

† £120,000 worth of this is produced by Devon Consols Mines.

I have been in the habit of classing the mining field of West Cornwall into *ten* districts,† which I believe to be as convenient an arrangement as can well be made. Like all classification it is of course to some extent arbitrary, for the various districts run into each other; but still I think I shall be able to show that the districts I adopt are each characterised by distinctive mining and geognostic features, and that they are not therefore purely topographical divisions. Whether this is really the case or not, is a matter of very considerable economic importance; for mining-brokers, and indeed certain mine agents, are not unfrequently in the habit of drawing inferences as to what *may* occur in one district from what *has* occurred in another—such inferences being, in my opinion, often wholly groundless, from the fact that the mining and geognostic conditions of the two districts are so dissimilar as to make the comparison inadmissible.

Beginning at the west, we have first the two districts of *St. Just* and *St. Ives*, which flank respectively the north-west and north-east borders of the granite range of the Peninsula of Penwith—the most western of the five great granite ranges that form at once the most distinctive geographical and geological features of Cornwall and South Devon.

1. *St. Just District*.—This district, situated in the extreme west, skirts the coast of the Atlantic for about 6 miles from north to south—from the northern bounds of the parish to a mile or so south of Cape Cornwall, and extends inland from 2 to 3 miles. It is situated principally in the parish of St. Just, and has long enjoyed a world-wide celebrity from the peculiar position of its mines—perched on the sides of almost perpendicular cliffs, and excavated for upwards of half-a-mile under the bed of the ocean. Inland, the country is entirely granite; but nearly parallel with the coast, and coinciding with the metalliferous district, this forms a junction with the clay-slate or killas, which is here largely, and seemingly confusedly, intermixed with hornblendic rocks—whether eruptive or metamorphic has yet to be ascertained. The older workings—and this is a very ancient district—are situated entirely in the granite, which rock produces tin exclusively; but of late years the killas and its associated hornblendic rocks have been found in places to be very productive for copper—principally in the form of the vitreous or “grey” ore. It is in following these copper deposits that workings have, of late years, been pushed so far out under the sea. The St. Just district is, in every respect, one full of interest. Its richest metalliferous deposits are met with under conditions seemingly exceptional to any similar ore-deposits in the county; and the workings of its mines also present many peculiarities—remnants of the past—which however are fast disappearing under the march of improvement, which within the last seven years has made many changes in this remote district.

2. *St. Ives' District*.—This district occupies a somewhat analogous position to that of St. Just on the opposite side of the Land's End

* Mr. Henwood divides it into *eight* districts: St. Just, St. Ives, Marazion, Gwinnear and Crowan, Helston, Camborne and Illogan, Redruth and Gwennap, and St. Agnes and Perranzabuloe.

granite range. The granite forms a similar junction with the killas, skirting the coast of St. Ives' Bay—the killas likewise showing an extensive development of hornblende rock. The lodes occur in both rocks; but while they are exclusively tin-bearing in the granite, they have usually, where productive, made copper in the killas and hornblende rock. Their copper produce, however, is at present insignificant, all the important workings being in the granite and for tin. The greatest length of this district, in a north-west line skirting the granite junction, is about 4 miles, and its greatest width, measured at right-angles to this, from $2\frac{1}{2}$ to 3 miles. It includes the larger proportion of the three parishes of St. Ives, Lelant, and Towednack. As a mining district, it possesses many marked peculiarities, the most notable of which is the very frequent formation of "carbonas," or pipe-veins of tin, shooting off from the lodes into the neighbouring rock; or, what is still more peculiar, the occurrence of large and rich masses of oxide of tin, surrounded on all sides by extremely hard granite, and seemingly wholly unconnected with any vein whatever.

(To be continued.)

On the New Form of Blast-Furnace Invented by General Rachette.

BY DR. L. BECK, OF THE METALLURGICAL LABORATORY,
ROYAL SCHOOL OF MINES.

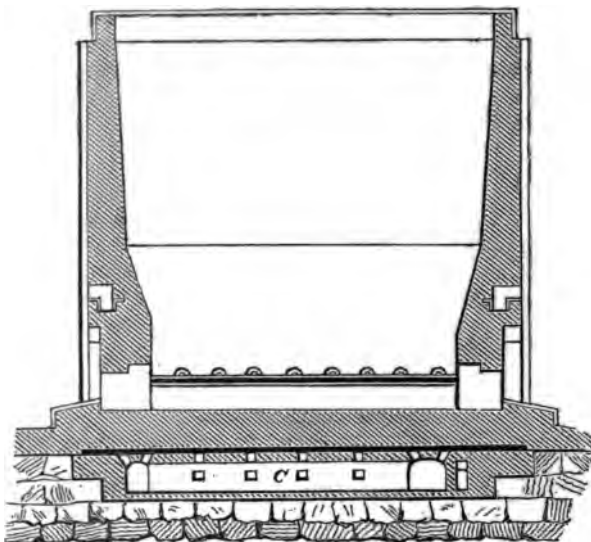
(Concluded from page 202.)

ANOTHER important feature in Rachette's system is the separate flue *c* (figs. 15, 16) for heating and drying the whole erection. It is situated beneath the sole of the hearth and consists of the flues (*c*), $1\frac{1}{2}$ ' high, and 2' wide, with the secondary passages (*c c*), four or six of which branch off from each side of (*c*). They pass along under the sole, and from them a great number of vertical and horizontal flues or channels branch off, distributed through the whole stack of the furnace. By this system of passages the heating of the furnace is very quickly and perfectly effected, proceeding from the exterior towards the interior of the furnace, affording great advantages in comparison with the ordinary method of heating blast-furnaces, viz., from the interior to the exterior by means of fuel burnt in the hearth. With this new system it is possible to proceed simultaneously with building and drying the upper parts of the furnace. The horizontal passages (*c c*) under the hearth are covered with plates of cast iron upon which the bottom of the hearth is rammed in with hammered refractory clay, in copper furnaces $1\frac{1}{2}$ ', in iron furnaces $2\frac{1}{2}$ ' thick. By means of the flue beneath the hearth this sole is perfectly dried in about two and a-half days and the temperature may be raised to such a

height, that fuel charged through the throat will ignite on coming in contact with the bottom.

FIG. 15.

VERTICAL SECTION ALONG THE LENGTH OF FURNACE.



Another advantage obtained by this system of passages is, that by surrounding the body of the furnace almost completely with a covering of air, the circulation of which may be stopped by closing the flues, the radiation of the heat from the surface of the stack is to a great extent prevented, which is the more necessary the brickwork of the stack being so thin. The same passages will serve to accelerate the cooling of the furnace after it has been blown out, by opening them and allowing a stream of air to pass freely through them. The heating of an iron furnace, which had been erected in two and a-half months, and which had been dried and built simultaneously was completed in ten days, while the heating of a round furnace usually requires four months and a much greater expenditure of fuel.

The thickness of the stack of copper furnaces is only $2\frac{1}{2}'$, the iron furnaces being 4' thick at their lower part, and 3' at their upper part. The lining of the short sides or ends remains uncovered. Almost all the hearth also is open, the whole series of twyers having one opening in common. This opening is formed of three arches supported by iron pillars. The walls must be carefully secured with iron binders and the best materials must be used for the lining, especially for the hearth, which must be refractory, because with such a small pressure of blast the foci are near the sides. Herr Aubel found them commencing $2\frac{1}{2}''$ from the mouth of the twyer and their diameter was 5". The temperature in the foci was so high, that cold blast of 3°C . (37°Fahr.) being employed from 8 to 10 grammes of platinum were

completely melted. It may be mentioned, that in an ordinary Sefström furnace the focus lies only $1\frac{1}{2}$ " from the blast-holes. For the large make of these furnaces a great volume of blast is necessary although at no great pressure. The pressure at the iron furnaces of Nischne Tagilsk, working with charcoal, is from $2\frac{1}{4}$ " to $2\frac{3}{4}$ " of mercury, it having been from 3" to $3\frac{3}{4}$ " in the old furnaces; so that at present a well constructed fan would be sufficient. Coke of course will require a somewhat higher pressure. In an iron furnace of twelve twyers the diameter of a single twyer would be (supposing 8,000 cubic feet of blast to be necessary per minute) according to the formula,

$$F = \frac{\left(1 + 0.028 \times \frac{h}{b}\right) Q}{12 \times 0.92 \times 0.60 \sqrt{2g \frac{p}{d} \times \frac{h}{b}}} = 5.75 \text{ centimtr.} = 2.3 \text{ inches,}$$

where—

Q is the quantity of blast in cubic feet,

h the pressure of the blast in inches of mercury,

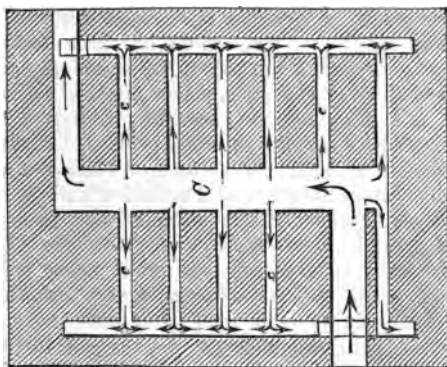
b the height of the barometer,

$\frac{p}{d}$ the ratio of the specific gravities of mercury and atmospheric air.

The cost of construction of Rachette's furnaces is very moderate. For example the first furnace on this system erected at Nischne Tagilsk cost 3,079 silver rubles (about 500*l.* sterling). The average cost of the old iron furnaces in Russia was 3,500 silver rubles (about 560*l.* sterling). In England, according to Mr. Tate, who has taken

FIG. 16.

HORIZONTAL SECTION THROUGH HEATING FLUES.



out a patent for those furnaces, their cost will not exceed 800*l.*, while furnaces of the ordinary construction require an expenditure of from 1,200*l.* to 1,500*l.* It must also be remembered that, while these latter furnaces require a year for their construction and about four months for heating, those on the new system can be easily erected in from two and a-half to three months, and can be put in operation at once. The average cost of a copper furnace at Nischne

Tagilsk would be 650 silver rubles (about 100*l.* sterling), and in England, according to Mr. Tate, it would be from 200*l.* to 240*l.* The royalty charge for license is very small.

With regard to the management and application of Rachette's so called "Normal and Universal Furnaces." Herr Aubel states, that they might be employed for smelting all sorts of ores, metals and metallurgical products, such as platinum, nickel, wrought iron, pig-iron, copper, regulus, speisse, &c., as well as for the manufacture of steel direct from the ores, which latter is reported to be proved by experiments. At present, however, only copper and iron ores are smelted on a large scale, and this furnace would scarcely be suitable for smelting lead ores as there would probably be too great a volatilisation of the metal in them. Neither does it seem to be proved, that wrought iron or steel can be melted in them without changing their nature. Rich gold and silver ores are sure to be always smelted in crucibles, and the only reason for smelting platinum in them would be if it could be proved that it can be smelted in contact with carbon without combining with it. Herr Aubel has smelted platinum between gas coke, and he is convinced of the purity of the platinum thus smelted, which was highly malleable, and showed even the parting of the button, which, according to Deville's experiments, should be a proof of its perfect purity.

The results of copper smelting have been exceedingly favourable. Whilst formerly at Nischne Tagilsk only 160 cwts. of ores could be treated in twenty-four hours in one furnace, in these improved furnaces of Rachette, from 45" to 48" wide, 16' to 17' long, and 13' to 14' high, 1,128 cwts. are treated in the same time with a saving of as much as 33% of fuel and 40% in wages. They give 15% less slag, the slags themselves being much poorer and of a more uniform nature, the poor slags contained only 0.1% of copper.

The practical results of the trials of these furnaces are very favourable as will be seen from the table accompanying this paper, giving a comparison of the three furnaces at Nischne Tagilsk, the old furnaces from the same place, the charcoal furnaces of Altenau in the Harz mountains, a coke furnace at Blaenavon, and a new coal furnace in Staffordshire. Comparing the volume of Rachette's furnaces and those on the old system at Nischne Tagilsk, it will be seen that the increased make with respect to this volume is in the ratio of $3\frac{1}{2}:1$. The old furnaces, the interior capacity of which was 5420 cubic feet, only made 419 cwt. of pig-iron in twenty-four hours, smelting 605 cwt. of ores, while the new furnaces, the interior capacity of which is only 1,950 cubic feet, made 551 cwt. of pig-iron in the same time, smelting 810 cwt. of ores. In the old furnaces the ores remained in the interior of the furnace for twenty-four hours, while on the new system they only remain seven hours.

Another remarkable fact is the richness of the charges of ores at Nischne Tagilsk, consisting only of the pure magnetic iron ore containing as much as 72.44% of iron. The average number of charges during twenty-four hours is 67, consisting of 846 lbs. of ores and 73 cubic feet of charcoal, from which 658.8 (= 68%) of the best grey pig-iron is produced. The average make in twenty-four hours

is nearly 80 tons. The saving in fuel is as much as from 15 to 20%.

It must be remembered, however, that all experiments made at present have been made with this rich magnetic iron ore and with charcoal: the results of the new furnace at Mülheim must prove if the process will be equally applicable in employing coke and less refractory ores than those of the Ural. It seems to me, after all, that this will probably be proved; but there is still another point which should not be passed over. In all furnaces which have been hitherto constructed only grey pig-iron has been produced, at least no one has succeeded in making white or grey iron at discretion; for in many cases as soon as the ores arrived completely prepared, that is reduced and carbonised, in the zone of fusion, grey pig-iron was obtained, and it was only in consequence of an irregularity that white iron was once made. This occurred the first time the furnace was used, when it was not known how necessary it is in charging to place the ores towards the middle of the throat, instead of charging in the usual manner. The consequence was that an irregular fusion set in, and a "bear" was formed in the middle of the sole, dividing the hearth into two separate parts. In tapping, the iron was found to flow out white on one side and grey on the other. Grey iron is always obtained when the process goes on regularly, but this is no new thing, it being well known that in round furnaces also with narrow hearths constructed for grey iron white iron will only be produced if the reduction of the ores has not been completed before their arrival in the zone of fusion, causing part of the iron to pass into the slags; but in this case the white iron always contains a small quantity only of carbon. Notwithstanding this fact, there have been persons who have doubted whether it is at all possible to produce white iron in Rachette's furnaces. But there is no theoretical reason why white iron may not be produced if the furnace were only properly adapted for that purpose. But whether practical advantages of equal importance will be obtained in producing white pig-iron as in grey is a very different question. Certainly the heat in the hearth must be diminished, and this must be done by widening it, for with a narrow hearth the iron will always be grey. With the widening of the hearth the whole furnace must be raised higher in order to effect the complete preparation of the ore, the more so as the shorter the time the charge is in passing through the furnace the greater will be the make. With the widening of the hearth it will be also necessary to increase the pressure of the blast in order to force the foci more towards the centre of the furnace. If the same make only is intended nozzles of a smaller diameter must be adopted; and it may be found also more convenient to use ten twyers and to increase the distance between them proportionately. Even a larger make might be possible than with grey iron if such proportions were given to the furnace that the ore arrived perfectly prepared before the twyers, and this will be done by increasing the height of the furnace, and probably by making the sides rather steeper. This would certainly be more effective than if the same height were retained, the sides of the body made flatter, or separate boshes constructed. On these

Name of the Iron Works or of the Furnace.	Description of the Furnace.			Quantity of Ores Smelted in 24 Hours. cwts.	Nature of the Ores.	Per- centage.	Consumption of Fuel in 24 hours.			Make of Fire per 24 hours. cwt.	Consumption of Fuel per 1 cwt. of Pig. Iron.		
	Capacity of the Furnace in cubic ft.	Height in feet.	No. of the Tuyers.				Coal in cwt.	Coke in cwt.	Charcoal, cubic ft.		Coal, cubic ft.	Coke, cubic ft.	Charcoal, cubic ft.
WERCHNE LALDA. Blast-furnace on the Ra- chette principle. First furnace for experiments, only with one tymph.	2180	30-9	6	Greatest make 935-71 Average make of 9 months 805-23	Magnetites	69	—	—	5493-6	660-4	—	—	9-145
						67-8	—	—	4875-6	511-5	—	—	10-486
WERCHNE LALDA. Blast-furnace on the Ra- chette principle. Second furnace for experiments, only with one tymph.	3052	41-2	8	Greatest make 936-7 Average make of 6 months 900-63	Magnetites	69-2	—	—	5493-6	648-5	—	—	9-265
						67-2	—	—	5465-6	578-8	—	—	10-355
NISCHNE TAGILSK. Blast-furnace on the Rachette principle.	2125-5	22-66	12	Greatest make 882-61 Average make of 8 months 792-0	Magnetites	67	—	—	5569-9	604-8	—	—	10-355
						68	—	—	5341	550-0	—	—	10-682
NISCHNE TAGILSK. Blast-furnace of the old round form.	5907-8	51-5	2	666-4	Magnetites	67-5	—	—	4578	449-6	—	—	11-118
ALTENAU, in the Harz.	1090	28-84	1	944-1	Hematites, Magnetites, and earthy brown iron ore	37-25	—	—	915-6	55	—	—	18-53 = 106 lbs.
Blast-furnace at Blaenavon.	3878-22	—	3	904-37	—	37-04	—	653-2	—	385-0	—	2-125	—
New blast-furnaces in Staffordshire.	4583-45	—	5-7	1004-9	—	44-4	1340	—	—	446-6	3-27	—	—

points also the experiments at Mülheim will soon afford us full information. On the whole it seems scarcely practicable to expect any one Rachette furnace to produce the various qualities of pig-iron. Each quality requires a distinctive form of furnace, and to attempt to produce different qualities in the same form will only lead to a great waste of fuel. Very slight differences in form seem to be of great importance in Rachette's furnaces, where it is quite impossible to make white iron in a furnace meant for grey iron. It would be easier, perhaps, to make grey iron in a furnace constructed for white iron by employing hot blast. The experiments in progress at the new iron works at Mülheim may also be expected to decide several other questions, and the results which may be looked for from this place during the next few months will be of the greatest importance and interest not only to all iron masters but also to copper smelters, for this system of furnace may be of great advantage at the large copper works where blast-furnaces are used. Professor Tunner, in his report on the last Exhibition, suggested this form of furnace as that best adapted for the Swansea works.

NOTE.—Since Dr. Beck's paper has been in type, we have received advices of the result of the first cast at the trial furnace at Mülheim he refers to, which is reported to have been exceedingly favourable, the metal produced being superior grey foundry pig.—
ED. M. & S. M.

Improved Mechanical Puddlers.

ADOPTED AT THE CLOS-MORTIER FORGES, HAUTE-MARNE.*

(Concluded from page 203.)

Better results, however, have been obtained with double furnaces than with single furnaces. The former have, indeed, long been known to practical men as being much more advantageous than the latter—producing a superior quality of iron with a diminished consumption of fuel. That they have not been generally adopted is doubtless attributable to the fact that they required such a greatly increased amount of labour compared with single furnaces; a difficulty, however, that disappears with the adoption of the mechanical puddler—which even increases their hitherto recognised advantages, inasmuch as the greatly augmented activity given to the work enables the weight of the charge of pig-iron, and with it the size of the furnace, to be still further increased. It is obvious, indeed, that the working of these heavy rabbles, stirring the metal over every portion of the sole of the furnace, must have a very energetic action on it.

* From a Note by M. Lemut in the *Annales des Mines*, vol. iv, p. 505.

Following out the experiments in the way of enlarging the furnaces and accelerating the operation, the stirring period has been still further shortened and the waste sensibly diminished, by attaching two rabblers instead of one to the end of each swing-beam *h h* (Plate IV, Figs. 1, 2, 3). To effect this, the doors of the furnace have two openings, one of which the puddler closes alternately when he commences making up the balls by hand in the usual manner, at the end of the heat. To such a furnace from 6 to 8 cwts. of cast-iron is charged. The ten puddled balls produced from this charge are taken out by both doors, so that their shingling does not occupy a longer time than in a single furnace of only half the capacity. It may be added, that this former furnace, with two doors opposite to each other, allows of the employment of an extremely simple mechanism. The inspection of Fig. 3, Plate IV, shows that in describing lines, which are nothing more than the radii of the circles of which the doors are the centres, the rabblers reach every part of the sole of a double furnace. Whence it follows that the oscillating pedestal *v* of the system shown in Figs. 7, 8, and 9, Plate III,* and the levers *x*, *o*, *p*, which give rise to the complicated movement of the apparatus shown in Figs. 1, 2, 3, 4, 5, and 6, Plate III, may generally be dispensed with and replaced by the simple apparatus shown in Plate IV.

The first of these mechanical puddlers, Figs. 1, 2, and 3, Plate IV, is suitable where the furnace has only two doors, and where there is no impediment to suspending it from the roof. It requires no special description, inasmuch as it is essentially the same as that described in the notice already referred to, which appeared in this Magazine last year.

The mechanical puddlers, shown in Figs. 4, 5, 6, 7, 8, and 9, Plate IV,† are applicable to furnaces that have several doors opposite each other, and especially to those that have a steam boiler fitted above them. The description given of an analagous apparatus for a single furnace, Figs. 1, 2, 3, 4, 5, and 6, Plate III, renders it unnecessary to enter into details here, as the modifications will be readily understood by an inspection of the drawings without any tedious written description. The arrangements do not differ essentially except in the suppression of the intermediate lever *o s q*—the connecting rod *j m s*, being attached directly to the arm *q x*, keyed in the axle *x x*. It may be added, that the oscillating shaft *o o* affords facilities for attaching any required number of connecting rods *g*, and that the apparatus is eminently adaptable to any modification that it may be found necessary to make in the arrangements of the furnaces.

The arrangement of the notches which terminate the connecting rod *g* are such as to enable the workman to connect or disconnect at will one or other of the rods without stopping the machinery, so that any one of the rabblers may be stopped working, or set to work again without in the least interfering in the arrangement of the others.

These apparatus are also very suitable when the steam boiler on

* For Plate III, see last number of *Mining and Smelting Magazine*.

† In the Plate, Fig. 8, which is over Fig. 9, is incorrectly lettered as "Fig. 7."

the top of the furnace leaves little space at disposal above it. It often happens that the arrangements of the forge is such that it would be scarcely possible to transmit from one motive-engine the power to work all the mechanical puddlers in use. In such a case small steam-engines of from 1 to 2 H. P. are adopted; and such an engine works the mechanical puddlers of several adjoining furnaces. This arrangement will often be the most economical, and besides has the obvious advantage of avoiding the risk of the whole forge being thrown idle from an accident occurring to a single engine.

It thus appears that mechanical puddlers may be adapted to almost every form of the puddling furnace, and every condition under which it is placed. The practical advantages obtained from their use may be summoned up as follows:—

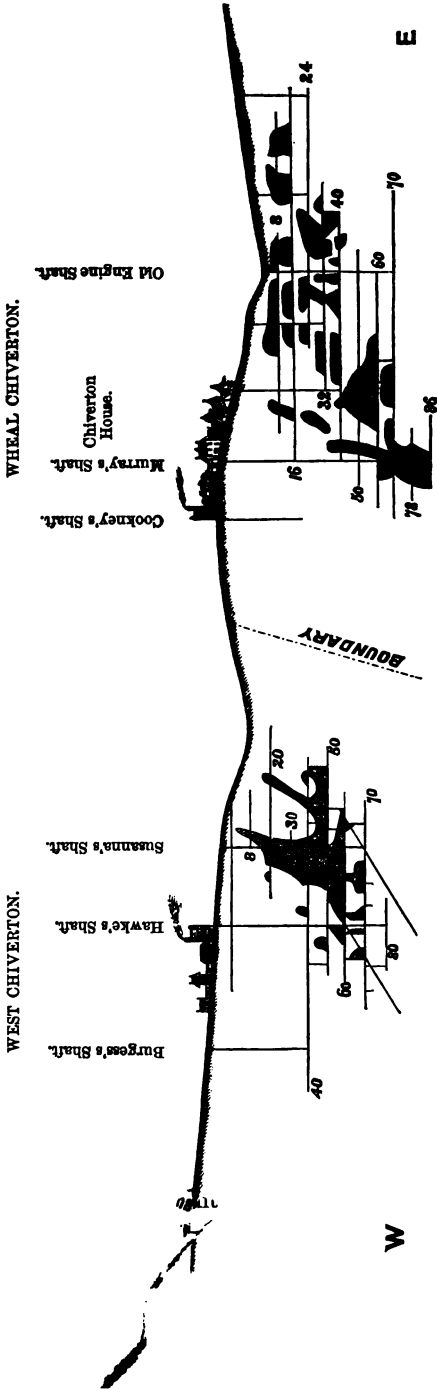
1. The consumption of fuel per ton of iron made is considerably reduced;
2. The work is accelerated and the production per furnace increased, by which an economy is effected in general expenses and maintenance;
3. The cost of labour is reduced by dispensing with the “under-hand,” even when the wages of the puddler is increased while his labour is diminished.
4. The waste in the puddling is not diminished, but it is notably reduced on the re-heating;
5. But the most important result of mechanical puddling is the improvement of the quality of the iron. Grey pig-iron made with coke, which was difficult to refine under the energetic action of three or four heavy rabbles, came to nature in a very short time without any addition of cinders, and produced iron of a superior quality.

The Chiverton Mines.

AN extraordinary amount of public attention having, during the last few months, been directed to the Chiverton Mines and the lead-mining district in their neighbourhood, a short description of them will probably not be unacceptable to our readers.

The lead-bearing district lying to the north of Truro, in the parishes of Newlyn, Perranzabuloe, St. Erme, and St. Allen, has been worked with very varying energy for a great number of years. The oldest mine in the district appears to have been Old Wheal Shepherds, in Newlyn parish, worked many years ago by Sir Christopher Hawkins; and next followed Wheal Rose, on parallel lodes some few hundred fathoms to the south, which at one period was worked by Messrs. John Taylor & Sons. Both these mines are understood to have been moderately successful, and Old Shepherds is stated to be promising at the bottom, and would probably be

Fig. 17.
SECTION ON LINE OF WEST CHIVERTON AND WHEAL CHIVERTON MAIN LODES.
Scale: 100 fms. to 1 inch.



now re-worked if the sett could be obtained—which, however, is not possible at present, in consequence of a disputed title between the Hawkins family and the See of Exeter, represented by the Ecclesiastical Commissioners. Wheal Rose, however, appears to have been worked poor—indeed, the small profit which it returned seems to have done little more than recoupe the original outlay. Both these mines are on east and west lodes, but the great mine of this district—East Wheal Rose—which returned in a few years as great an amount of profit as was probably ever returned in an equal period by any lead mine in England, was on north and south lodes.

The magnificent success of East Wheal Rose, which was in the height of its prosperity about 15 years ago, gave of course an immense impetus to the district. A large number of new mines were put to work, in which, in most cases, shares went to an extravagant premium; but, strange to say, they all ended in failure—a failure due, we believe, not so much to the demerits of many of the concerns, as to the fact that the whole district, having been puffed up to the highest point of inflation, suddenly collapsed. Where such an unreasonable inflation exists, a similar collapse is only too common; and when it does take place the panic is generally found to be as indiscriminating and unreasonable as the mania that preceded it. Such was certainly the case here, for although several promising setts were in operation, not one survived the panic, so that for some period lead mining in this district was only represented by one struggling mine—Cargoll—formerly worked as a portion of East Wheal Rose.

But, although in the same district, the Chiverton mines are nearly 4 miles from East Wheal Rose in a south-west direction. The lodes have an east and west bearing—that is, they course about E. 18° N. magnetic—and are therefore parallel with the Shepherds and Wheal Rose lodes, ranging about 400 fathoms south of the latter—that is if they continue far enough east to reach the parallel of those old mines. There are only two mines to which the name Chiverton properly belongs—Wheal Chiverton and West Chiverton—although it has recently been appropriated wholesale by two-thirds of the new mines in the district. The relative position of those two mines and their workings, is shown by the section Fig. 17 on the opposite page.

WHEAL CHIVERTON, worked to a great extent under the pleasure grounds of Chiverton House—which indeed was formerly the count-house of the mine—was commenced by a company got up by Mr. Stainsby, by which company it was worked to a depth of 86 fms. at the western (or Murray's) shaft, as shown in the section. The principal engine shaft, however, upon which there was a 50' pumping engine, and which is 100 fathoms further west, is, it will be seen, only down to the 70. This is due to the western dip of the ore, which about the old engine shaft and for some scores of fathoms east and west made from the surface to the 40, but below this level shot off rapidly west, leaving the eastern part of the mine poor at the deeper levels. During the working by this company some scores of thousands of pounds worth of lead were returned, but yet, unaccountably, the adventure resulted in a loss of nearly 40,000*l*. It is

beyond question, however, that this is to be attributed to grossly bad management, and that, under any decent system of working, the mine would have yielded at least a fair profit. As to the state of the mine when abandoned, as far as we can ascertain, the eastern part—east of Murray's—was poor; but the deeper levels going west—the 78 and the 86—were in ore ground; so that it would appear that the shoot of ore still continues dipping west towards West Chiverton. No doubt influenced by this view, the present reworking of the mine has been set about by commencing a new engine shaft (Cookney's shaft) 30 fathoms west of Murray's. On this a 60" pumping engine and a 24" steam-capstan have been erected; and there is little doubt but that when the shaft is sunk sufficiently deep it will open out lead ground between the deep western ends of Wheal Chiverton and West Chiverton boundary, where at this level there will be 90 or 100 fathoms of whole ground to explore. Besides the main lode, there are also some other lodes to explore in this sett, the principal of which is a caunter lode, which goes off considerably N. of E. from about the centre of the old workings.

WEST CHIVERTON, as will be seen, immediately adjoins Wheal Chiverton, and is almost entirely a new working. Three lodes—the general bearing of which we have already stated to be E. 18° N. magnetic—have been opened on in this sett: Williams's (or the main) lode; Valpy's lode to the south of this, below the 50; and Elizabeth's lode to the north of it—all underlying south, and the relative positions of which will be readily understood from the accompanying transverse section Fig. 18.

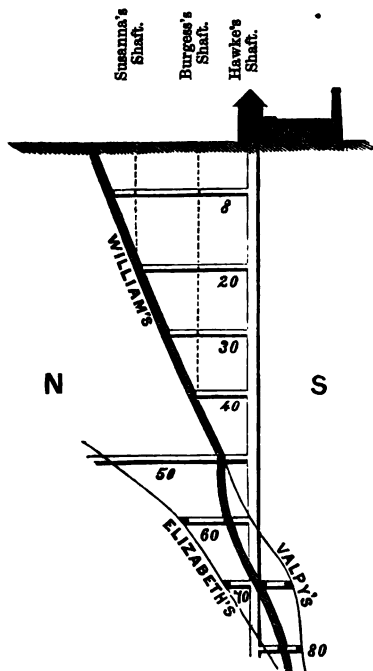
Williams's lode, which, as will be seen by the section Fig. 19 on the opposite page, has been opened on by two shafts 40 fathoms apart—Hawke's engine shaft, sunk vertically from the surface to the 80, crossing the lode at the 70; and Susanna's shaft sunk to the 70 almost all the way on the lode—is a very large lode, and, where productive, generally makes lead throughout, so that it yields a great deal of "dradgy" work. Shallow, it was characterised by a large sparry back, but, as is shown by the section, the lead ground was short above the 40. At this level the run of lead ground was about 30 fathoms long, but at the 50 fathom level it had lengthened to 60 fathoms. Below the 50, as shown by transverse section Fig. 18, the underlie of Williams's lode became more downright, and another lode went off south which has been called Valpy's lode.

On being opened on east and west at the 60, it was found that this Valpy's lode not merely formed a junction with the main lode going upwards, but did the same thing going east and west—leaving in fact only a large "horse" of ground between the two lodes. At the 70 this "horse," as shown by section Fig. 18, was a little wider, and the length between the eastern and western junction of the two lodes had also increased slightly from 52 to 55 fathoms. At the 80 the "horse" begins narrowing again (as will be seen from the section); and therefore, although Valpy's lode at this level has only been opened on for 40 fathoms, it is not improbable that the distance between the two junctions may likewise become slightly shortened. At the 60 the eastern junction of these lodes was about 15 fathoms east of Susanna's, and the western junction a fathom or so east of

Hawke's; while at the 70 the eastern junction was at the bottom of Susanna's shaft, and the western one about 15 fathoms west of Hawke's. This shows a dip of the junction west of fully 15 fathoms for 10 fathoms in depth, as will be seen by a glance at the section Fig. 19, where the eastern and western junctions are shown by faint lines.

FIG. 18.

TRANSVERSE SECTION AT HAWKE'S SHAFT. Scale: 30 fms. to 1 inch.

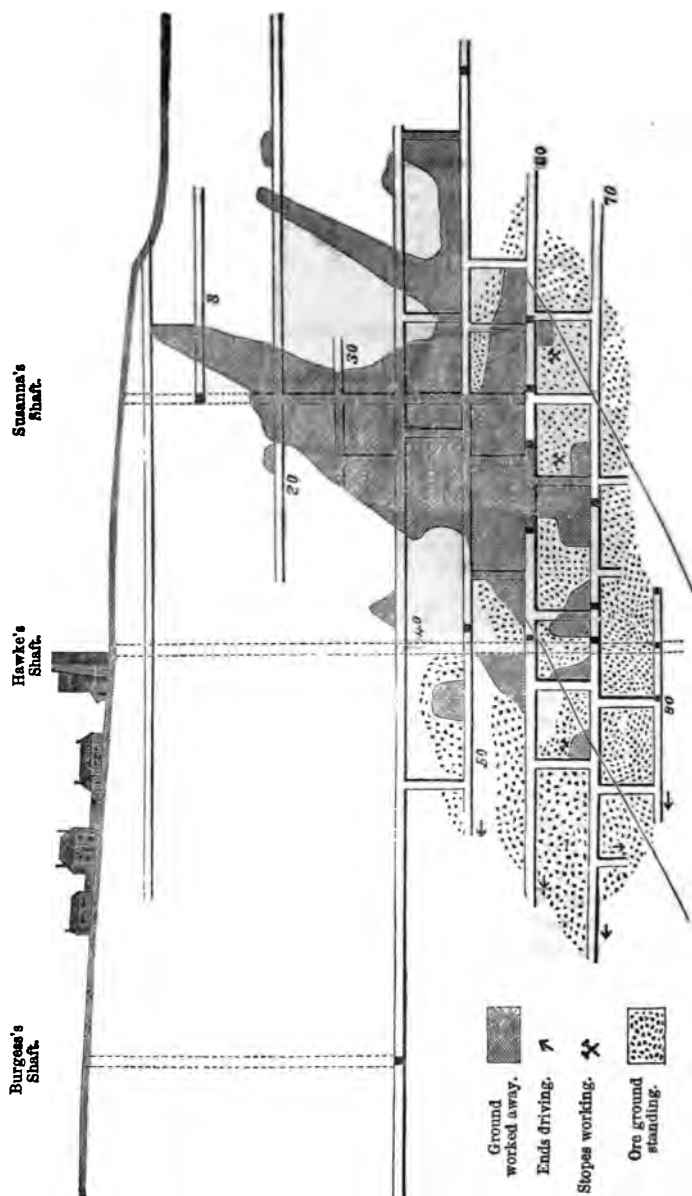


Whether Valpy's is to be considered as a distinct lode, or only as a south part separated from the main lode by a "horse," is not merely an interesting question, but also one of some practical moment. From what we can see at the 80 it seems to be again falling back towards the main lode, and appears as if it would probably fall into it again at the 90. If this should occur, of course Valpy's lode, now one of the most important features in the mine, would be at an end.

The position of Elizabeth's lode is so clearly shown in the transverse section that it is scarcely necessary to say more about it here. In the 60 it is about 8 fathoms north of Williams's, in the 70 4 fathoms, and in the 80 but 2 fathoms: above the 60 it goes off flat, the two lodes at the 50 being nearly 20 fathoms apart. It would thus seem also, like Valpy's, to be tending to a junction with the main lode at the 90.

FIG. 19.

SECTION ON COURSE OF WILLIAMS'S LOPE. Scale 30 fms. to 1 inch.



The workings on Williams's lode are sufficiently shown by the section Fig. 19, to preclude the necessity of any very lengthened description. Besides the two shafts already named—Susanna's and Hawke's—a third, named Burgess's shaft, 65 fathoms west of Hawke's, has been sunk perpendicular to cut the lode at the 40, below which level it is (or immediately will be) sinking. It is of obvious importance to expedite the sinking of this shaft as much as possible, as the western dip of the ore ground carries it rapidly in this direction; for it must be understood that not only does Valpy's lode dip bodily west $1\frac{1}{2}$ in 1, but the best ore ground on Williams's lode seems to dip with the junctions—this lode making as it were richest opposite the rich ground on Valpy's lode on the other side of the "horse," according, apparently, to the well-known dogma of "ore against ore." There were four ends driving on Williams's lode recently by twenty men; the 50 west, the 70 west, the 80 west, and the 80 east, worth in the aggregate 90*l.* per fathom, and driving at an average cost of about 8*l.* per fathom. There were four winzes and rises by sixteen men, worth in the aggregate 100*l.* per fathom, and working at an average cost of a little over 8*l.* There were five stopes working by twenty-six men, showing an aggregate value of 120*l.* per fathom, and working at an average cost of 4*l.* per fathom. There are no tribute pitches on this lode, or indeed in this mine at all.

While Williams's is a very large lode, containing lead scattered throughout, Valpy's makes its ore much more compact, and, for the number of men employed, gives returns twice as great as those yielded by Williams's. The workings on this lode will be understood from the accompanying section, Fig. 20, which also shows the limits of its junction with the main lode—beyond which limits the reader must fully remember Valpy's lode has no existence. The only levels driving on it are the 80 east and west, by ten men; the upper levels having gone through the 55 fathoms in length for which the lode exists. The aggregate value of these two ends is 100*l.* per fathom, and they are driving at 5*l.* per fathom each. There are two rich winzes sinking below the 70 on this lode by eight men, worth in the aggregate 80*l.* per fathom, and sinking on an average for 7*l.* 10*s.* There is only one stope, working by four men, at 3*l.* 10*s.* per fathom, worth 30*l.* No. 1 winze, below the 70, sunk opposite Hawke's shaft, has opened out a good run of ground; No. 2, 10 fathoms east of this, has averaged 30*l.* per fathom. Of those now sinking, No. 3 will reach the junction just at the 80, and No. 4 in a couple of fathoms more sinking.

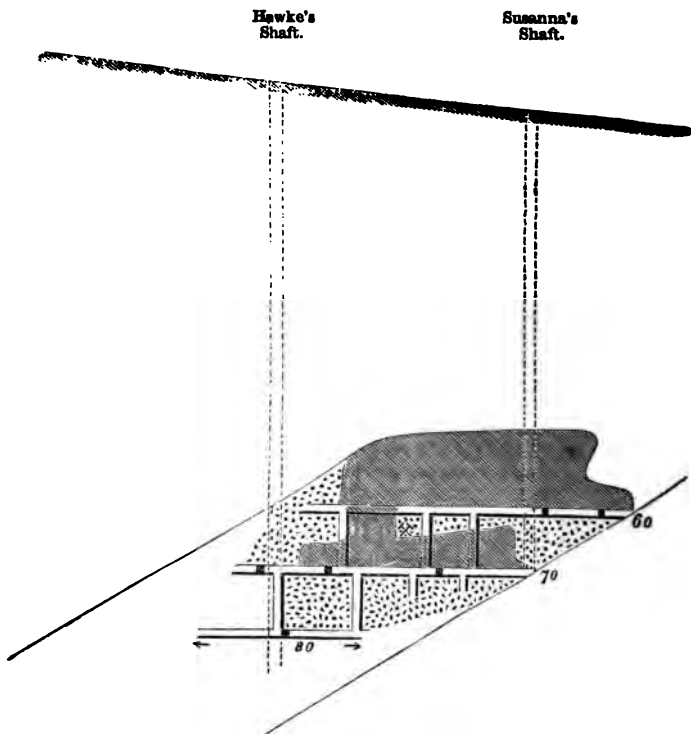
The character of Elizabeth's lode is to a great extent distinct from either of the others, being of a more flucany character, and making apparently lead richer in silver. On this lode there are four levels driving by eighteen men, worth in the aggregate 28*l.* per fathom. There is a winze and a rise working by eight men, with an aggregate value of 50*l.*; and two stopes working by six men of an aggregate value of 30*l.* The cost of working this lode is about the same as that of the others.

West Chiverton is at present netting 1,000*l.* a-month profit, and Cargoll, about $3\frac{1}{2}$ miles to the north-east, is about paying cost; but

no other mine in the district is yielding any returns worth mentioning. Yet on this foundation has been raised one of the most remarkable speculative manias seen of late years—there being at present some twenty companies in this district, making an immensely lavish expenditure, with scarcely any appearance of immediate returns. Although we think highly of the prospects of several points in this district, we cannot blind ourselves to the amount of rashness at present exhibited, which we fear may ultimately be as injurious to the district and the general character of mining, as similar proceedings have been found to be elsewhere.

FIG 20.

SECTION ON COURSE OF VALPY'S LODE. Scale: 30 fms. to 1 inch.



Abstracts and Reviews.

LAMY'S NEW IRON FURNACE.

In suggesting a new form of furnace for smelting iron, M. Lamy points out that in the ordinary form of blast-furnace the iron which has been reduced and combined with the necessary proportion of carbon to convert it into *cast-iron*, meets an oxidising temperature in the hearth, which causes a part of the cast-iron to pass into the slag. He therefore proposes to do away with this oxidising period, and even to replace it by a reducing atmosphere. In the ordinary furnace, too, the proportions of the various parts soon become so changed as to interfere with the working, by which the time a furnace can remain in blast is limited.

The refining also requires the fusion of the pig-iron under an oxidising flame, by which a fresh quantity of iron is scorified: the waste in this respect is 10%. Again, the puddling takes place in a furnace with an oxidising atmosphere, from which results a fresh loss. The total loss in converting pig-iron into wrought-iron is therefore not less than from 15 to 20%, requiring also a considerable expenditure of fuel. To reduce this loss and expenditure M. Lamy has endeavoured to combine the three operations into one, by doing away with the oxidising of the metal; which he effects by replacing the various furnaces now used by a single one, in which the ore is at once converted either into malleable wrought iron or into steel.

M. Lamy's furnace consists of two distinct parts placed over each other. In the upper part the cast-iron is made, and in the lower part this is converted into wrought iron and steel.

The upper part of the apparatus, where the pig-iron is smelted out from its ores, differs from ordinary blast-furnaces in the body and boshes being formed of two distinct truncated cones, connected by their bases, but separated from each other by a narrow opening, which the inventor calls the *pyrote*. The twyers, which are in the upper part of the boshes, have a plunging blast. The hearth is formed of a slightly inclined plane which leads to the crucible.

Under this upper part, or modified blast furnace, is the lower part of the apparatus, in the middle of which is an annular space arranged in steps, and lower down a sole slightly inclined towards two doors. In the centre of this sole an axle, protected by solid masonry, transmits its movement to an iron turbine formed of a platform furnished with several ranges of perpendicular knives, for the purpose of breaking up or dividing the molten matter driven out by the centrifugal force of the turbine. On each side are two fire-places, arranged so as not to give off oxidising gases. Lastly, at the lower part of the annular space, are two kinds of twyers—the one bring air from the blowing engines, and the other injecting superheated steam.

The mode of working is as follows: when the furnace is charged, the blast is turned on to the upper twyers, and a high temperature is produced in the boshes. The atmosphere, at first oxidising, becomes rapidly reducing in consequence of the transformation of the carbonic acid into carbonic oxide. The products of combustion arrive in the hearth, whence they are carried off by conduits, leading from the top of the crucible into the body of the furnace, and thus heating the charges introduced at the throat. The ores, therefore, in descending, only meet with reducing gases; but if it is required to increase the temperature, recourse is had to small twyers, placed at the bottom of the hearth, which only throw in sufficient air to oxidise a portion of the carbonic oxide. The metallic product, perfectly

liquified, flows along the inclined plane to the crucible; and may be tapped in the usual manner if the object is only to get cast-iron.

But when wrought-iron has to be made, the melted cast-iron is brought on the centre of the turbine, the latter being in motion, and the air and steam twyers opened. The cast-iron is thus divided, and in this state is brought in contact with an eminently oxidising atmosphere; the air partly oxidises the carbon and the silicon in the cast-iron, and the steam reacts on the phosphorus and the sulphur; so that refined wrought-iron is obtained very rapidly.

The third part of the operation now commences. The carbon of the cast-iron reacts on the bed, composed of rich slags and battitures of wrought-iron; and after rabbling the puddled ball is ready for shingling.

When it is required to make steel directly, it suffices to dispense with the covering of rich slags and battitures of wrought-iron on the sole, and to increase the blast in the twyers and the rotation of the turbine.

ROYAL GEOLOGICAL SOCIETY OF IRELAND.

At the last meeting of this Society—known to our readers as the Geological Society of Dublin—held in the New Museum, Trinity College, Dublin, on April 13th, the Council announced that, having submitted a memorial to the Home Office, praying that Her Majesty might be pleased to permit the addition of the word “Royal” to its title, which it had been before resolved to alter to the “Geological Society of Ireland,”—the title of the “Geological Society of Dublin” appearing to confine its labours to the immediate vicinity of that city—a communication had been received from Sir George Grey that Her Majesty had been graciously pleased to comply with the prayer of the petition, and signified that in future the members of the Society be styled Fellows of the Royal Geological Society of Ireland. In announcing this gratifying result, the Council desired to tender their thanks to Lord Talbot de Malahide, a former President, to whose exertions they considered themselves mainly indebted for the successful issue of their application. They also expressed their acknowledgments to Mr. Robert Mallet, F.R.S., to whose unceasing efforts they attribute the speedy acquisition of this new dignity to the Society.

For our part we wish the Society every success under its new title, which, with its extended scope, entails on them a wider field of labour. As the Geological Society of Dublin they have earned a high reputation among the provincial Societies of the United Kingdom; and we do not doubt that, in their more extended field, they will worthily maintain it, possessing as they do among their members such eminent geologists as Mr. J. Beete Jukes and the Rev. Professor Haughton.

Three papers were read at the meeting, “On a Polished and Striated Surface in the Limestone of Ross Hill, county Galway,” by Mr. Ormsby; a “New Echinoderm from the Yellow Sandstone of Donegal,” by Mr. Harte; and “On Thalliferous Pyrites from Ballydehob, county Cork,” by Mr. Emerson Reynolds.

MINING STATISTICS OF SPAIN.

We have received from our esteemed correspondent Señor José de Monasterio, the eminent Spanish Government Mining Engineer, and Secretary of the Editorial Committee of the *Revista Minera*, the following statistics of the produce of the Government Mines and Smelting Works for 1861.

I.—PRODUCTIVE MINES.

Number of Productive Mines.	Area of Surface in Metres.	Number of Workmen.	Quantity of Ores Produced in Metrical Quintals.															
			Iron.	Lead.	Silver.	Copper.	Tin.	Gold.	Zinc.	Quicksilver.	Antimony.	Manganese.	Soda.	Alum.	Coal.	Peat.	Asphaltum.	
1,795	220,193,419-84	29,492	51	1,392,508-91	3,375,190-29	30,054-25	1,512,972-79	18,883-68	500	247,436	68,942	1,160	140,712-02	116,012	89,381-05	3,310,549-36	222,919-55	24,168-67

III.—SMELTING AND CHEMICAL WORKS.

Number of Smelting Works.	Number of Workmen.		Hydraulic Engines.	Steam Engines.	Furnaces.					Products in Metric Quintals.													
	In Operation.	Not Working.			High.	Blast.	Reverberatory.	Retineries.	Catalan.	Cast.	Wrought.	Steel.	Lead.	Silver in (Kilogrammes).	Copper.	Zinc.	Tin.	Quicksilver.	Antimony.	Soda.	Alum.	Sulphur.	Asphaltum.
369	128	10,747	441	138	64	494	284	111	261	345,322-56	328,166-16	1,440-86	624,010-03	8,020-87	17,091-84	22,198	70	294-02	84	25,286	4,241	45,311-79	1,478-79

III.—PRODUCE OF THE GOVERNMENT MINES.

Name of the Works.	Province.	Class of Ore.	Quantity Extracted. Metrical Quintals.	Number of Workmen.	Products Obtained.		Number of Workmen.	Total Value in	
					Nature.	Metrical Quintals.		Reales Vellon.	£ Sterling.
Almaden	...	Sulphide of Mercury	113,597.69	2,737	Quicksilver ...	9,079.84	273	144,730,904.77	1,507,613.59
Riohinto	...	Copper Pyrite	953,140.68	704	Copper ...	11,909.08	805		
Laues	...	Sulphide of Lead	35,742.46	156	Lead ...	22,566.72	78		
Hollin	...	Sulphur	...	—	Sulphur ...	824.44	153		
Sundry Works	...	Salt	...	—	Salt ...	2,017,747.32	—		

*** *Editor's Note.*—The *metrical quintal* is as nearly as possible 2 cwt., so that the quantities given can be readily got at in tons by merely moving the decimal point one figure forward. A *kilogramme*, in which the silver produce is given, equals 2.2 lbs.

Extracts, Notes, and Memoranda.

DENSITY OF ZIRCON.—A recent number of the *Comptes Rendus* contains the abstract of a paper read before a late meeting of the Academy by M. A. Damour, who considers the wide variation in hardness and density, for which this mineral species is remarkable, to be due—not to differences in chemical composition—but to certain varying molecular conditions. The objections to this hypothesis are obvious to all mineralogists, and it will require much stronger proofs than M. Damour has brought forward to make it acceptable. The theory of M. Gustav Rose, that zircon, instead of being a silicate of zirconia (ZrO or Zr^2O^3) is really an isomorphous compound of silicic acid and zirconic acid (ZrO^2) (see *Poggendorffs Annalen*, 1859) seems certainly preferable; for it accounts for the varying hardness and gravity of the mineral by the varying proportions it contains of the two isomorphous acids—the heavier and harder specimens containing the more zirconic acid, whose equivalent would be 481.20 compared with 384.888 that of silica. The variety found in Russia by Hermann, the specific gravity of which was only 4.06 (while that of ordinary specimens range from 4.5 to 4.8) would, on this theory have a composition of $Zr^2 Si^2$.

NEW STRATITIC MINERAL.—The last number of the *Dublin Quarterly Journal of Science* contains a full description by Mr. M. H. Ormsby, B.A., of a new variety of this mineral family, which gives the rational formula of $2(2RO, SiO^2) + 5(2Al^2O^3, 3SiO^2) + 10HO$. A comparison of its composition with that of several minerals of nearly identical composition seems to show, in the author's views, that it is derived from the decomposition of felspar, according to the theory of Mr. Sterry Hunt, who ascribes the decomposition of earthy and alkaline silicates to the combined influence of water and carbonic acid, by which alkaline and earthy carbonates were formed and carried away, leaving only a hydrous silicate of alumina or kaolin; a process, however, which, in the case of the present mineral, was checked before it reached the final stage.

OBTAINING IRON FROM ITS ORE.—Mr. S. Ingledew, of Stockton-on-Tees, proposes to obtain the iron from the ore without the aid of a blast-furnace, by first pulverising the ore in an ordinary apparatus, and then placing it in a perforated rotating chamber or receptacle, through which water passes, in which the heavier particles of granulated metal are precipitated to the bottom, the lighter earthy and other matters being carried off by the water. This residuum of washed granulated iron ore (which still retains a small quantity of silica and silicate of potassium) is then conveyed to an open flat vessel or "drying frame," where the moisture is evaporated, and it is afterwards passed into an ordinary air or reverberatory furnace. In order to regulate the quality of the iron, he employs, in connection with the granulated iron from the drying frame, any necessary proportion of alkaline earth, alkaline bases, and carbonaceous matter, which will have the effect of chemically combining with any extraneous matter, so as to facilitate the separation of the iron, and so influence the quality as to render it applicable to the production of bar-iron, plates, or other descriptions of manufactured iron.

A NEW FORM OF GUNPOWDER.—Messrs. Hall and Wells, of Worcester, propose a new gunpowder to consist of 47 parts of chlorate of potash, 38 parts of ferro-cyanide of potassium, and 5 parts of sulphur. The

ingredients after being first pulverised are mixed into a paste with water; when dry about 10 parts of caoutchouc are added, and the compound is complete. One of its peculiar features is that it may be so moulded, that the entire charge shall constitute a solid mass, thus greatly facilitating the manufacture of cartridges.

OXYGEN A TETRA-ATOMIC ELEMENT.—M. Naquet imagines that he has established the tetra-atomic character of sulphur and selenium; and in that case he argues that, considering the many analogies which exist between sulphur and oxygen, and also that the atomicity of a body may vary with the radical with which it enters into combination, we are justified in supposing that oxygen belongs to the sulphur, selenium, and tellurium family.

A NEW AMALGAMATOR.—Mr. Farrand, of San Francisco, proposes a new form of amalgamator, which consists of a trough-shaped machine of wood or iron, with dies to fit upon its inner surface. The mullers are attached to a rocking shaft, and are moved backwards and forwards instead of in a circular direction. The dies are parallelogram in shape, with grooves or recesses for the quicksilver, in which it is gently agitated with stirrers. The machine is reported to act very well, and is expected to give rise to important results.

OIL-LAMP FURNACE FOR FUSING METALS AT A WHITE HEAT.—Mr. Charles Griffin proposes to fuse metals by means of a furnace heated by mineral oil. The combustion of a quart of this (which only costs 9d.) gives a heat sufficient to fuse 5 lbs. of cast-iron. The furnace being cold when an operation is commenced, it will melt 1 lb. of cast-iron in 25 minutes; $1\frac{1}{2}$ lb. in 30 minutes; 4 lbs. in 45 minutes; and 5 lbs. in an hour. This furnace is said to possess this advantage, that platinum crucibles remain uninjured, as the rock oil does not give off sulphureous vapours.

OBTAINING CHLORIDES OF COPPER, COBALT, AND NICKEL FROM THEIR SULPHATES.—Mr. A. Monnier, of Philadelphia, U.S., proposes a new method of obtaining the chlorides of these metals in a more economical manner than has been hitherto effected, by treating their sulphates with chlorides of sodium, or other compounds of chlorine,—such as chloride of potassium, calcium, magnesium, and strontium, or the hypochlorites of lime, potash, and soda; but especially with chloride of sodium, on account of its cheapness and the readiness with which it can be obtained.

AUSTRIAN ENGINEERS' ASSOCIATION.—At the last meeting of the mining section of this Association Herr Friese exhibited some specimens of a chrome pig-iron which had been obtained from some experimental charges of chrome clay ironstone at the St. Stephan ironworks. The iron has a white, almost lustrous fracture and is very brittle, for which reason the ores, notwithstanding their high percentage, have been hitherto considered to be useless. Accurate analyses of the ore and iron have not yet been made; with proper treatment, however, it may not be impossible to obtain useful pig-iron from these ores. Herr Friese also exhibited some samples of blasting powder, which, besides being cheaper, is considerably more effective than the ordinary blasting powder. The inventor calls it "non-explosive blasting powder," or "Alcaloxide." So far as tried, it seems to burn very slowly, but further investigations as to its qualities are about to be made. At the same meeting Herr E. Bittsänsky spoke very favourably of Ziervogel's method of extracting silver described in the last two numbers of this magazine.

THE USE OF PETROLEUM AS A FUEL.—The commission appointed by the American Government to inquire into the relative evaporative powers of

petroleum oil, as compared with anthracite coal, the practicability of its use, if unattended with danger, and its advantages, if any, have issued their report. The commission was composed of three chief engineers, and their experiments extended over a period of five months. As regards exaporation the reply was, that it is 103% superior in power to anthracite coal, while the time required for generating steam to 20 lbs. pressure was only 28 minutes against 60 minutes. The commissioners accordingly recommended the Secretary of the Navy to introduce the oil on board one of the Government steamers, to determine practically its economical efficiency. As the rapidity of evaporation does not always correspond proportionably with the quantity of water evaporated by each pound of coal, it would be interesting to know the number of pounds or gallons of water evaporated by each gallon of petroleum, and the additional danger, as compared with coal, attending its use, because many of the great steam-boat accidents on the American rivers have been traceable to the careless use of turpentine, a less explosive material, for the same purpose. The advocates for the introduction of petroleum as a substitute for coal contend that in a vessel like the Cunard steamer *Persia* the saving, taking into account the smaller space required, and all other advantages, would amount to 2,400*l.* each trip. Experiments on a large scale will, it is said, speedily be made with an ocean steamer, by a company to whom the present patentees are about to transfer their rights. In addition to the discovery of extensive deposits of the oil in Southern Russia, large quantities are alleged to have been found on the Pacific in California. The calculations as to economy, however, seem to have been based on the assumption that the price would remain as now after the increase of demand, and also upon the cost of coal in America and not in England. It is alleged that its use will be a great saving, not only for merchant steamers, but that a naval steamer using it can keep the sea under steam three times as long with less labour and greater economy as compared with an equal weight of coal.

ACADEMY OF SCIENCES.—At the meeting of the Academy of Sciences on the 29th February, a note by M. Mène entitled "*Examen chimique des opérations du four à puddler dans la métallurgie du fer*," was referred to the Commission (composed of MM. Balard and Fremy) already appointed to examine other communications of the same author relative to the metallurgy of iron. At the meeting on March 14th, the second part of M. A. Scheurer-Kestner's memoir (abstracted by M. Pelouse), entitled "*Recherches théoriques sur la préparation de la Soude par le procédé Le Blanc*," was presented. The memoir is rather interesting to those connected with alkali manufacture, so that we may refer to it again.

A new weekly Journal, called *The American Coal Trade Review*, has been commenced at New York and Philadelphia. Its main object will be to publish reliable statistics in regard to the Mining and Shipping of Coal throughout the United States; together with occasional Historical and Scientific Articles upon the subject of Coal, and its bearings on the commercial and manufacturing prosperity of that country.

Mr. Hedley has resigned his appointment as Government Inspector of Mines for the Midland district, and is succeeded by Mr. Thomas Evans, who has been for many years Inspector of Mines for the South Wales district. Mr. Evans is succeeded by Mr. T. G. Wales.

We have to announce the deaths of Mr. William Hulton, one of the most extensive colliery proprietors in Lancashire, which took place at Leamington, on March 30th; and of Mr. William Llewellyn, of Glanwern, Pontypool, who was intimately connected with mining in the South Wales district, whose death took place at Malvern, on April 13th.

The great Paraffin patent case of *Young v. Fernie*, has been hearing before Vice-Chancellor Stuart for the last nine weeks. The evidence was concluded on April 25th, and the case is adjourned until May 2nd, when Sir Fitzroy Kelly will be heard for the defendants. The details of the evidence are very interesting, and altogether the case promises to become a *cause célèbre* both in a legal as well as a scientific point of view. The Vice-Chancellor seems to lean towards the plaintiff.

The first number of a new monthly magazine has been issued in New York by Mr. G. E. Currie, under the title of the "*American Mining Gazette and Geological Magazine*."

A notice of Dr. Percy's Metallurgy is in type, and will appear next month.

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STETEFELDT, C.—Cagniardellen und Cylindergebläse. (Berg-Geist, Nrs. 29, 30, 1864.)

TAYLOR, J.—On the Drift Deposits in the Neighbourhood of Crewe, Cheshire. (Coll. Guardian, April 2, 1864.)

WESTGARTH, W.—The Colony of Victoria: its History, Commerce, and Gold Mining; its Social and Political Institutions down to the end of 1863. (London, 8vo., 1864.)

ZINC.—(Revista Minera, Nr. 333.)

Patents relating to Mining and Metallurgy.

(Compiled from Commissioners of Patents' Journal.—Subject matter only given.)

UNITED KINGDOM.

APPLICATION FOR PATENTS FROM MARCH 26TH TO APRIL 23RD.

762 (1864). E. LEVER, Method of fixing hoops in the interior of flexible tubing employed in the ventilation of mines.

775 (1864). I. M. EVANS, Improvements in blasting for mining purposes.

784 (1864). H. SMITH and E. ROBERTS, Machinery for breaking stones and minerals.

786 (1864). J. LANG, Certain improvements in the ventilation of mines.

795 (1864). W. E. NEWTON (com. from N. J. JACQUET), Machinery for boring rocks.

835 (1864). T. BRIGGS (com. from E. JONES), Apparatus for pumping water out of mines.

868 (1864). C. J. L. LEFFLER, Improved apparatus for pulverising minerals and amalgamating them with oleaginous and other liquids.

885 (1864). J. LLOYD, Improvements in puddling iron.

895 (1864). J. NISBET, Improvements in getting or cutting minerals, and in apparatus therefor.

988 (1864). J. H. JOHNSON (com. from J. WILLIAMS), Improvements in puddling furnaces.

1,019 (1864). J. E. DUYCK, Improvements in distilling and purifying petroleum oils and other hydro-carbons.

1,021 (1864). J. E. DUYCK, Improvements in treating petroleum and other hydro-carbon oils.

1,036 (1864). H. BENNETT, Improvements in puddling iron, steel-iron and steel, and in apparatus for facilitating the same.

PATENTS SEALED FROM MARCH 31ST TO APRIL 26TH.

2,425 (1863). E. B. WILSON, Manufacture of iron and other metals.

218 (1864). G. DARLINGTON, Manufacture of zinc white.

2,531 (1863). J. POLGLASE and J. COX, Improved apparatus for boring and cleaving stone.

2,555 (1863). A. BUDENBERG (com. from B. A. SCHAEFFER and C. F. BUDENBERG), An improved blasting powder.

2,583 (1863). G. HOWELL, Apparatus for condensing metallic fumes.

2,630 (1863). W. LOCKE, J. WARRINGTON, W. E. CARRETT, W. E. MARSHALL, and J. TELFORD, Improvements in working coal, minerals, and earthy matters, and in the machinery employed therein.

2,624 (1863). E. S. CREASE, Machinery for drilling, boring, or excavating rock, or other earthy substances.

- 430 (1864). G. H. JOHNSON, New method of constructing cupola and blast-furnaces.
 3,233 (1863). D. ADAMSON, Apparatus employed in the manufacture of steel and iron.
 2,852 (1863). W. E. NEWTON (com. from M. A. A. GAUDIN), Manufacture of wrought and cast-iron and steel.
 3,044 (1863). J. BOWRON and G. ROBINSON, Manufacture of soda and sulphuric acid.
 265 (1864). H. BESSEMER, Manufacture of armour plates.

PATENTS ON WHICH £50 DUTY HAS BEEN PAID FROM MARCH 21ST TO APRIL 22ND.

- 719 (1861). J. VICTOR and J. POLGLASE, Safety fuses for mining purposes.
 769 (1861). J. G. WILLANS, Preparation of hydrated oxide of iron, and its application for the absorption or separation of sulphur from certain gases.
 1,006 (1861). P. WARD, Manufacture of sulphuric acid.
 1,051 (1861). F. C. WARLICH, Improvements in preparing coal used in the manufacture of artificial fuel.

PATENTS ON WHICH £100 DUTY HAS BEEN PAID, ON MARCH 24TH.

- 838 (1857). R. CASSELS and T. MORTON, Manufacture of iron.

PATENTS VOID BY NON-PAYMENT OF DUTY FROM MARCH 26TH TO APRIL 16TH.

- 777 (1861). R. A. BROOMAN (com. from W. SPIELFELD), Manufacture of shear steel.
 989 (1857). E. EDWARDS and E. BEACHER, Machinery for washing mineral and other substances.
 1,045 (1857). C. BARLOW (com. from T. ALDRIDGE), Consuming the smoke and gases of furnaces, and at the same time furnishing a hot air blast, being a smoke and gas consuming hot air blast-furnace.

COLONY OF VICTORIA (AUSTRALIA).

PATENTS FROM NOV. 27TH, 1862, TO OCT 26TH, 1863.

- 476 (627). J. ROBSON and W. LANCASHIRE, An invention for grinding, extracting, arresting, and amalgamating gold from sand, tailings, and pyrites.
 478 (629). G. A. KNOBEL, Improved machinery for crushing, grinding, and amalgamating quartz, quartz tailings, and other auriferous earth, copper, and silver.
 482 (633). G. FOORD and W. CLARKE, jun., An improved method of extracting silver from its ores.
 490 (641). J. AINSLIE, A new and improved mode of treating mineral substances.
 491 (642). J. HUNT, Friction pulley and chain driving gear, specially adapted for puddling machines.
 494 (645). A. C. L. DE LACY, Furnaces and machinery for calcining and pulverising gangue, and the separation of gold and other metals from gangue metals, metalloids, and other analogous matters.
 497 (648). A. MILLER, An invention for extracting and amalgamating gold from quartz or debris, called "Miller's Central Forces Amalgamator."
 498 (649). W. GLASS, Treatment of sulphuret of antimony, and obtaining products therefrom.

AUSTRIA.

PATENTS DELIVERED DURING JANUARY.

16. E. BREUL, A peculiar blasting powder.
 26. P. STAHL, A peculiar construction of kilns for burning limestone and quartz.

48. J. PETER, Improvements in the construction of Blacke's machine for breaking stone.

BELGIUM.

PATENTS DELIVERED FROM MARCH 31ST TO APRIL 15TH.

- 15,877. J. ONIONS, Manufacture of iron and steel.
- 15,879. N. O. ANDRE, Treatment of the waste of tinned sheet-iron.
- 15,897. H. HARRISON, Machine for cutting coal and minerals.
- 15,900. A. DINANT, Fastenings of miners' lamps.
- 15,941. A. LEARCH, Manufacture of pig-iron, iron and steel.

FRANCE.

CURRENT LIST OF PATENTS.

- 60,678. HACHETTE-BERNARD, Hollow twyers composed of red copper and sheet-iron for blast-furnaces.
- 60,688. THE COMPANY OF THE SOUTHERN GOLD BEDS, A machine for cleansing and washing auriferous earth.
- 60,793. BOVILL and MAC-CONNELL, Manufacture of armour plates.
- 60,859. BENNETT, Improvements in puddling iron and steel.
- 60,866. CHAPUIS and DE COMBETTES, Miners' lamps called "Alarum Lamps."

HANOVER.

PATENTS DELIVERED FROM NOV. 17TH TO DEC. 18TH.

- 7. DR. ROLLE, A vertical retort for distilling brown coal, and other bituminous substances.
- 19. M. GERSTENHÖFER, A new construction of furnaces for roasting sulphur pyrites.

PRUSSIA.

PATENT CANCELLED ON MARCH 23RD.

- 1. C. G. CLEMM, Manufacture of sulphuric acid.

SAXONY.

PATENT GRANTED ON JAN. 15th.

- 9. E. BEEUL, Blasting powder free from sulphur.

UNITED STATES.

PATENTS ISSUED FROM MARCH 15TH TO APRIL 5TH.

- 41,913. J. S. FOSTER, Rock-drilling machine.
- 41,978. S. P. DUFFIELD, Improved soluble silicate.
- 41,989. E. J. HALL, Improved furnace for smelting ores.
- 42,047. H. HOCHSTATTER, Improved mining powder.
- 42,065. J. A. BERTOLA, Improved apparatus for concentrating auriferous ores.
- 42,100. J. T. McDUGAL, Improvement in reducing ores of copper and silver.
- 42,167. J. CODY, A rock-drill.
- 42,257. J. E. LUNDGREW, Improved mode of pulverising and preparing coal for use.

SPECIFICATIONS PUBLISHED, AND PRICES.

FROM MARCH 19TH TO APRIL 16TH.

* * Specifications will be forwarded by post on receipt of price and postage at Her Majesty's Patent Office, 25, Southampton Buildings, London, W.C.—The amount of postage may be estimated from the price, as follows:—Where price does not exceed 1s. 6d., postage will be 1d.; above 1s. 6d., and not exceeding 3s. 4d., it will be 2d.; above 3s. 4d., and not exceeding 6s. 4d., it will be 4d.—Sums exceeding 6s. must be remitted by P. O. O., on Holborn Office, payable to *Beunet Woodcroft*.

- 1,954 (1863). R. A. BROOMAN (com. from C. C. P. N. PERNOLET), Coke ovens; 2s. 2d.
 1,958 (1863). E. MOREWOOD, Coating metals; 1s. 6d.
 1,987 (1863). R. MUSHET, Manufacture of cast-steel; 4d.
 2,012 (1863). E. B. WILSON, Blast-furnaces; 6d.
 2,021 (1863). G. YATES, Indicating quantities drawn from pits or mines; 10d.
 2,080 (1863). R. GRIFFITHS, Retorts or ovens for extracting coal oil; 10d.
 2,086 (1863). R. A. BROOMAN (com. from H. MICOLON), Metallic alloy; 4d.
 2,110 (1863). W. E. NEWTON (com. from M. COLSON), Extracting minerals from mines; 4d.
 2,122 (1863). G. DAVIES (com. from A. L. FLEURY), Manufacture of iron and steel; 4d.
 2125 (1863). E. VICKERS, Manufacture of steel; 4d.

Current Review of Mining, Quarrying, and Metallurgy.

CORNWALL, DEVON, AND WEST SOMERSET.

THE heavy continuous fall in the copper standard has at last been checked, but the tin standard has again declined 4*l*., notwithstanding which, however, tin mining continues brisk. The mines on the whole seem to be looking well, but there have been no improvements during the month worthy of notice. A number of new setts continue to be brought out, principally in the Wheal Vor and Chiverton districts.

Seventy-nine *South Condurrow* shares were sold by auction at the Vice-warden's Court at from 20*s*. to 24*s*. per share, 4*s*. 6*d*. call to pay; 577 *Hawkmoor* shares were sold at the same time, for 1*s*. per share.

At *Great Wheal Vor* Ivey's shaft has not yet got quite through the slide, which is not, as some people seem to imagine, a definite line, but a widish extent of broken ground. The 147 east from Ivey's, and the 146 west from Metal shaft still continue to hold out prospects of being productive from shaft to shaft. *East Lovell* is reported to have improved at one or two points, but the mine undoubtedly selling at a very high price. The lode at the shaft below the 26 fm. level is said to be worth 126*l*. per fm. The 20, on the north lode, 150*l*. *Great Wheal Fortune* is slightly improving. The lode in the 98, east of Hosken's shaft, continues to look well, and the 102 east is looking better. At *Sithney Carnmeal*, the lode in the winze at the bottom of the 85 is looking well, as also that in the 95 west. At *Sithney Metal*, the lode in the 60 is reported worth 20*l*. per fm.; the 58 east is also improved. At *East Great Grylls*, the lode is said to have been cut into at the 10 below adit. At *Treloweth*, the stope west of sump winze is reported worth 50*l*. per fm. The stope east of the lode 30*l*. per fm. At *Wheal Reeth*, an old tin mine in the Lelant district, the reopening of which has been a very heavy affair, prospects are improving, a good discovery having been made in the eastern part of the mine, where the lode is said to be worth 120*l*. per fm.

At the last *South Crofty* meeting the agents reported that they had not yet arrived at the granite, which was expected to effect an important im-

provement in the returns, but they think it is not far distant. At *Wheal Seton*, Tilly's shaft, below the 150, is producing 20 tons per fm. worth 7l. per ton. The sump winze, 18 fms. east of the above, and 8 fms. below the 150, is producing 18 tons per fm. The ends, winzes, and stopes altogether turn out upwards of 100 tons per fm., and prospects are considered very favourable. At *West Seton*, the lode in the 110 fm. level, 107 fms. west of shaft, is 6' wide, yielding 8 tons of ore per fm., worth 80l. per fm. The last 4 fms. in this level yielded ores of the value of 100l. per fm. This appears to be an important feature in the mine west of the cross-course. The 76 fm. level here was of no value; the 82 fm. level gave a little ore; the 90 fm. level tribute ground; the 100 fm. level, short rich bunches of ore; the 110 fm. level, as stated above, a good course of ore. At *South Seton* a new 70' engine is to be erected. At *Wheal Grenville*, the engine shaft is down 6 fms. under the 90 fm. level; the lode in the last 3 fms. sinking fell off to 30l. per fm.; but is now reported worth 80l. per fm. and improving. At *East Rosewarne*, the 75 west is said to be worth 16l. per fm.; the winze below the 55, 25l. per fm.

At *Cook's Kitchen* the engine shaft is sunk 11 fms. under the 246 fms. level—the last 6 fms. through good tin ground. There is a south lode which is likely to fall in with the main lode, at or near the 258 fms. level, which is thought to be a favourable indication for this mine in depth. The 246 is driven east upwards of 20 fms., and is worth from 25l. to 30l. per fm.; the 234 is driven east, to within 8 fms. of a course of tin, gone down in the bottom of the 222 fm. level, 6 fms. long, and worth 110l. per fm. This mine is now returning about 20 tons of black tin per month, which will about pay the current cost of working. At *Dolcoath*, the bottom is still unproductive, but the eastern levels are discovering a large amount of tin. At *Clifford Amalgamated*, the ends turn out in the aggregate 20 tons; winzes, 12½ tons; stopes, 15l tons; and shafts, 9 tons per fm. The levels east of Clifford's engine shaft are not so good. *Treavean* is reported to have improved, and the agents are sanguine as to the results, if the adventurers have patience, as the prospects west are encouraging. *East Bassel* is becoming very poor. At *Tywarnhaile* the ends generally are not looking so well. Nearly 6,000l. have been lost in this mine during the last thirteen months. *East Carn Brea* is reported to be improving, and to be looking better than it has done for some time past. In the old engine shaft, sinking under the 70, the lode has been intersected, worth two tons of ore per fm.; and in driving a cross-cut at the 30 fm. level from the middle lode the south part of the lode has been intersected worth 9 tons per fm. At *South Carn Brea*, owing to the very low quality of the tin stuff, and the pooriness of the mine, the losses are 450l. a month; and it is said, that unless an improvement takes place in a few months, some of the large shareholders will not be disposed to go on with it. This mine has been a sad disappointment. Our favourable views of *Great Wheal Busy* continue to be borne out. Offord's shaft is worth 30l. per fm.; the 130 east, 30l.; the winze below the 130, 50l. A good lode of tin has been cut under the slide in the 140 west. At *Boscawen*, the 70 west is worth from 15l. to 20l. per fm. *Hallenbeagle* is being steadily drained by the adjoining mine, and the water will shortly be under the 36 fm. level, which will enable them to work some of their good ore ground. At *East Treskerby*, prospects are slightly better. The eastern shaft has been cleared to the bottom where there is a good tinny lode. At *North Treskerby*, a good lode is reported to be making its appearance at Tresidder shaft, and it is said that a new lode has been intersected in the 47 cross-cut. Mining in the Great Wheal Busy district is going on well. *Great North Downs* is looking up, as the lode recently cut in Wheal Rose is going into Great North Downs sett. At *Wheal Rose*, the lode in the 80 is still reported to look exceedingly well. The *West Briton* reports that it is said 100 shares

in this mine have been purchased by a well-known mining capitalist for 6,000*l.*

At *West Chiverton*, the 80 west on Valpy's lode is worth 100*l.* per fm. The 80 west, on Williams's lode, is valued at 70*l.* per fm. At *Wheal Chiverton*, good progress is being made in sinking Cookney's engine-shaft, now down 43 fms. from surface; at Murray's shaft the water has been drained to the 40.

At *East Caradon*, the ends on the caunter lode are reported to be worth 80*l.* per fm.; on the new lode, 10*l.* per fm.; and the 70 west, on the south lode, 60*l.* per fm. At *South Caradon Wheal Hooper*, a branch in the 90 cross-cut north having been opened on, the agent almost thinks it is the leading part of the long-expected lode, in search of which the mine has been now working for some years. At *Gonamena*, the 90 west is holed to the stopes, and the lode is worth 4 tons per fm. At *Wheal Hope*, the lode in the 65 end has improved to 20*l.* per fm.

Marke Valley is to be conducted on the cost-book system. A special meeting of the adventurers of *Great Wheal Busy* was held on the mine (on March 30th) when it was resolved that that part of *Wheal Busy* sett, formerly called Old *Hallenbeagle*, be divided from *Great Wheal Busy*, and be in future carried on as a distinct and separate adventure under the name of *Hallenbeagle* mine; that the mine be constituted on the cost-book principle, divided into 6,000 shares, and that the same be allotted, *pro rata*, share per share, among the adventurers in *Great Wheal Busy*. At *West Wheal Vor* meeting it was resolved to purchase and erect an engine. At *North Robert* meeting (on April 12th) a resolution was unanimously passed to the effect, that in the opinion of the meeting, the dues should be permanently reduced to 1-20th both on tin and copper. A strong feeling was expressed that unless a considerable permanent reduction in the dues was made it might be advisable to take steps to abandon the mine. At *Treworlis* meeting (on April 12th) it was resolved to erect another engine of not less than 50' 130 fms. further west, where it is believed a good bunch of tin will be found.

The new companies announced during the month have been:—*Great East Lovell*, a piece of ground to the east of *Wheal Lovell*, is to be worked on the cost-book system in 3,000 shares; and it is proposed to offer a proportionate interest to the *East Lovell* shareholders at 3*l.* per share, which includes a call of 1*l.* per share recently made, the proceeds of which are to be applied to the working of the mine. A rather purposeless discussion has been going on between two mines in the *Wheal Vor* district, lying to the west of *Wheal Metal*, called respectively *West Wheal Vor* and *West Wheal Metal*, as to which possesses the *Wheal Metal* main lode; the promoters of *West Wheal Vor* having circulated a report that the *Wheal Metal* main lode did not pass through *West Wheal Metal* as had been affirmed, but had been cut in *West Wheal Vor*. The tracing of lodes any distance is always a very painful matter, on which people may reasonably differ, and is rarely a question of any practical importance where lodes are on about the same run. The *Great Wheal Metal* Tin Mining Company, with a capital of 30,000*l.* in shares of 5*l.* each, the object of which is to purchase and work a piece of ground to the west of *Great Wheal Vor*. *East Wheal Vor* on the cost-book system, in 6,000 shares, includes *Wheal Bramble* and some other mines at the foot of the *Wendron* granite range. It was last worked as *New Wheal Vor* and *East Wheal Metal*, and was subsequently attempted to be brought out, but unsuccessfully, as *New Wheal Fortune*. *Great South Chiverton* Silver-Lead Mining Company, on the cost-book system in 6,000 shares, adjoining *West Chiverton* on the south, under the respectable management of Captain John Nancarrow, of *St. Ives Consols*, ought to have as good prospects as any new sett in the district. *West Wheal Edward*, on the cost-book system in 100 shares of 25*l.* each, the object of which is to work a piece of ground adjoining *Wheal Edward* and *Hingston Down Consols*.

WALES AND THE BORDERS.

SOUTH WALES.—There has been an average business done in the iron trade, and the Staffordshire quarterly meetings have had the effect of bringing in more orders. The American States are likely to become large customers, as also India and the Colonies. It is most probable that the wages of the puddlers and other men employed at the works will soon have to be reduced, as they are now receiving more than is usual in proportion to the price of iron.

The directors of the *Myndy* Iron Ore Company (Limited) have determined on erecting blast furnaces on their property at Llantrissant, and the works are to be commenced without delay. The narrow gauge will shortly be connected with the property, and it is expected that a large quantity of the ore will then be used at the Aberdare and Merthyr works.

The puddling forge and mill have again been started at the *Aberamman* works, where the late boiler explosion occurred, and the blast furnaces are being put in order with all possible despatch. A second furnace has been blown in at *Golwyns*, and this neighbourhood promises to become before long one of the most prosperous localities in Monmouthshire. The necessary repairs are being rapidly proceeded with at the *Hirwain* works, and several of the coke ovens and also the brick kilns have been already lighted. No time will be lost in getting the furnaces ready for blast, and when the whole are lighted some hundreds of hands will receive regular employment. It is stated that another furnace is about to be blown in at the *Abernant* iron works, and operations are being vigorously carried on. The strike at *Blaenavon* has terminated by the men returning to work, and at the *Nant-y-Glo* works the men continue to work on Mr. Crawshaw Bailey's terms. The *Bury Port* Smelting Company are about to commence the erection of new works for smelting lead and zinc ores.

The *Melincrythan* Tin Plate Works near Neath, have been started. They are well situated, are of a very extensive character, and will give employment to between eight hundred and a thousand workmen.

The coal trade has been very active, with a brisk demand both for house and steam coal. But with the improvement in the trade the colliers still keep up a continual agitation for increase of wages, and at several of the collieries are now on strike. This is the case at the *Tillery*, *Caerphilly*, and *White Rose* pits. It is not expected, however, as was at first thought, that the strike will become more general.

The *Cindatillery* Colliery, Monmouthshire, has been purchased by the proprietors of the Pontnewynydd forge, so as to obtain a regular supply of coal and coke for their works. The *Avon Vale* Colliery has commenced working, and a considerable quantity of coal has been sent to Briton Ferry.

It is reported that proceedings have been commenced against Mr. T. W. Rhodes, proprietor of the *Risca* Collieries, for not complying with Mr. G. C. Greenwell's award respecting the sinking of a second shaft at the Black Vein Pit. It will be remembered that the jury at the *Risca* inquest recommended that a second shaft should be sunk, and the Government Inspector (Mr. Lionel Brough) having moved in the matter, the point was referred, under one of the clauses of the Mines' Inspection Act, to Mr. Greenwell for arbitration. The proceedings now commenced are for the enforcement of this arbitration, and the case it is said is likely to attract considerable attention.

Great disappointment is felt among the iron and coal masters at the rejection of the *Dute Dock* Bill by the Lords' Committee, and the expected increased dock and railway accommodation will not be realised at least for some time to come.

During the month of March 525 vessels were engaged in the trade of Swansea, with an aggregate registered tonnage of 63,699 tons, and the

shipping dues received amounted to 1,751*l.* 6*s.* 11*d.* As compared with the corresponding month last year, this shows an increase of 56 ships, about 10,000 tons tonnage, and 260*l.* 7*s.* 2*d.* in shipping dues. For the quarter ending March 31st the number of vessels trading with the port was 1,402, being an increase of 304 on the first quarter of 1863, and the increase in tonnage was 15,226 tons. Neath and Briton Ferry exported during the month of March 25,399 tons of coal, coke, and culm, 884 tons of bar iron, 326 tons of tin plates, 65 tons of copper, and making a total of 26,674 tons against 25,885 tons in March, 1863. The imports were 6,622 tons of iron ore, 3,739 tons of copper ore, and 2,115 tons of pig iron, making a total of 12,476 tons; 242 vessels were engaged in the trade of the two ports, with a registered tonnage of 19,969 tons. A larger export trade was done at Newport and Llanelli during the month, and the imports at Newport were also considerable.

The arrivals into Swansea have been:—Iron ore from Santander, Bilbao, Cherbourg, and Garrucha; copper ore from Coquimbo, Caldera, St. Sebastian, Hondeklip Bay, Havana, Santander, Leghorn, Pau de Azucar, Lisbon, Almeria, Carrisal Bajo, Huelva; copper regulus from Caldera, Cuba, Havana, and Carrisal Bajo; silver ore from Caldera, and Carrisal Bajo; and cobalt ore from Carrisal Bajo. The monthly return of the trade of the port clearly illustrates the injurious effects of the restrictive system adopted by the colliers, and the serious inconvenience and loss it must cause to the employers. During the month of March, the exports were 128,500 tons of coal, about 10,000 tons of iron, 2,000 tons of patent fuel, and 340 tons of coke, against 130,283 tons of coal, 17,228 tons of iron, and 4,000 tons of patent fuel in the previous month. The decrease, as compared with previous months is still larger, and is entirely accounted for by the men not turning out the usual quantity of coal per day.

The new undertakings announced during the month have been:—The *Trelech Lead Mining* Company, with a capital of 25,000*l.* in shares of 1*l.* each, for working the Carmarthen United Mines. The purchase-money has been fixed at 10,000*l.*, of which the vendors have agreed to take half in shares; the *Hendy Mining* Company, with a capital of 25,000*l.* in shares of 5*l.* each, formed for the purpose of working the deposits of hematite and argillaceous iron ores which form a continuation of those in the Mwyndy property, in the neighbourhood of Llantrissant; and the *Ton Mawr Estate and Coal* Company, with a capital of 120,000*l.* in shares of 10*l.* each. The object of this company is to purchase and develop 1,600 acres of freehold mineral land, situated about 4 miles from Neath, and in the centre of the great coal field of South Wales. Immediately adjacent to the freehold estate is the Ton Mawr Colliery, arrangements for the purchase of which have also been made. The purchase-money for the entire freehold and leasehold property, including stock, &c., is 65,000*l.*, of which 20,000*l.* may remain for a period upon mortgage of the freehold estates, at 5 per cent. per annum; 30,000*l.* is to be paid by instalments, and 15,000*l.* in 3,000 shares of the company (having 5*l.* paid thereon), leaving 9,000 shares to be issued to the public.

GLoucestershire.—The demand for the iron ore of the *Forest of Dean* is still on the increase, and has given rise to the opening of additional works. Some rich ore has also been found at the Great Doward Hill, near Monmouth, identical in character and geological position with that of Dean Forest. Some of the iron mines recently opened in the latter district are situated quite on the outcrop of the vein, and having been worked, at intervals, from ancient times, had, until very lately, been considered as exhausted. Present operations, however, show, that owing to the irregular manner in which the ore was formerly worked, a very large proportion still remains, almost at the surface, which is now being re-worked to advantage.

A good example may be seen at the *Crow's Nest Iron Mine*, near Coleford, where, after ridding off an accumulation of refuse material, an irregular bed of ore, upwards of 6 feet thick, is exposed and worked in open day. The excellent produce of the vein at its outcrop, on the western side of the Forest, is worthy of notice; the outcrop being commonly indicated by a belt of ancient workings or "scowles" often 60 or 80 yards in width. The ore is an hydrated peroxide of iron, commonly termed "brown hematite," the gangue being carbonate of lime. Hence its value for mixing with the silicious ores of many districts. Alone, or with the addition of a small quantity of burnt shale for flux, it yields a very tough grey iron, with a tendency to "red shortness."

The men employed at the *Golden Valley Colliery*, Bitton, having obtained the advance for which they recently struck, have resumed work.

The imports into Bristol have been:—92 tons of silver lead ore from Teignmouth; 50 casks of copper ore from Leghorn; 30 casks of yellow metal from Rotterdam; 95 tons of lead ore from Aberystwith, and 320 tons from Carls Fort; 545 tons of sulphur ore and 88 tons of pyrites from Arklow; 130 tons of iron ore from Donegal; and 14 barrels of sulphur and 14 casks of lead from Liverpool. During the month of March, 836 tons of coal and 3,675 tons of iron were exported from Bristol, as against 385 tons of coal and 200 tons of iron shipped in the corresponding month last year, showing an *increase* of 451 tons of coal and 3,475 tons of iron.

The imports into Gloucester include:—110 tons of coal from Llanelly, 95 tons from Saundersfoot, and 95 tons from Landshipping; 138 tons of sulphur from Pomaron, 80 tons from Plymouth, and 230 from Girgenti; 40 tons of iron from Swansea. The exports include:—454 tons of iron; 44 tons of coal; and 105 tons of ore.

NORTH WALES.—It is reported that gold has been found on the *Moel Tacwyn Gwendon* Mountains, and that an influential company has purchased the freehold, intending to forthwith commence active operations upon a large scale. Capt. John Parry, late manager of the *Vigra* and *Clogau Gold Mine*, is to undertake the management. A large portion of the shares have, it is said, been privately subscribed for. The *British Slate Company* has just been brought out with a capital of 100,000*l.*, in shares of 10*l.* each. The property purchased by the company consists of the *Roulin and Penlan Quarry*, situated at Caerhun, Carnarvonshire, and the *Cwm Eigia Slate Quarry* about four miles distant. The *North Golch Hill Mines*, in the parish of Holywell, Flintshire, now being worked by a private party, are about to pass into the hands of a public company. The mines are in the same district as the *Milwr*, *Rhosesmor*, *Speedwell*, *Holywell Level*, *Kilmorey*, and other mines.

MIDLAND COUNTIES, SOUTH LANCASHIRE, AND SOUTH YORKSHIRE.

STAFFORDSHIRE AND WARWICKSHIRE.—The coal trade has scarcely shown the same activity as it has done for the last few months, still a very fair business has been done and prices keep up pretty well.

There is little improvement to notice in the iron trade, although manufacturers appear to be well off for orders. The make of pig-iron remains considerably in excess of the consumption, and few sales are being effected. The American demand still continues good, but, with the exception of plates, the home demand has not been brisk. There is not much doing in ironstone.

The quarterly meetings of the *Staffordshire Ironmasters* have been held

during the month. At *Wolverhampton*, on the 13th, the attendance was numerous, but the business transacted was on a moderate scale, the proceedings being chiefly preparatory to the great meeting to be held at *Birmingham*, on the 14th. The prevailing opinion appeared to be that this will be a quiet quarter-day, and in that respect a great contrast to the meetings held three months ago. The fact is the high prices which have ruled of late have had the effect of putting a stop to all speculation in either finished or pig iron, while the feeling of doubt which has arisen as to whether the present rates can be maintained, has had the effect of making both home consumers and shippers extra cautious in reference to fresh engagements. The former are not disposed to order beyond their immediate requirements, and many of the latter are content to wait the completion of contracts for iron which is now in course of delivery, some of those contracts having been entered into months ago, prior to the last advance in prices taking place. But, notwithstanding the quietude thus brought about, the trade is not depressed, most of the principal makers in this district having been up to this time very fairly supplied with orders. As usual, the second-class makers have felt a pinch, and have in some instances been glad to take orders at a reduction. There is a good demand for *Staffordshire* iron for America, the makers who do business to that quarter being all of them well engaged. The general opinion at this meeting was that the present scale of prices will be maintained, and, notwithstanding the paucity of business, the tone was cheerful. In pig iron there was very little business done; consumers asked for a reduction in the price, which the principal makers were not disposed to yield. Hot blast, all mine, was quoted at 4*l.* 10*s.* per ton.

At *Birmingham*, on the 14th, there was a large attendance, all the principal firms engaged in the trade in this and other districts being represented. From the commencement there were indications that this was to be a flat quarter-day; consumers were disappointed at prices not going lower, and many of them held back from entering into fresh engagements in consequence; the result was that the transactions scarcely came up to the average. But notwithstanding the slackness in this respect, the iron-masters themselves expressed a confident opinion that the present scale of prices will be maintained for a time, and none of the leading firms would take orders at lower rates. But, the present state of the trade affords a striking illustration of the ill effects resulting from forcing prices beyond their natural level; had the last advance not been imposed it is probable that the trade would have been in a tolerably healthy state at this moment. As matters stand, the foreign demand is checked; and amongst home consumers there is a want of confidence in reference to the future of prices, the effect of which has been to bring about the languid tone manifested at the meeting yesterday. The real cause of this is the attitude assumed by the men in the middle of last year in their persistent demand for advances in the wages scale; these were conceded at the time, but in the end this will operate unfavourably for them. The sales of pig-iron were almost nominal. The quotation for best hot blast, all mine, was 4*l.* 10*s.* per ton, but buyers would not go beyond 4*l.* 7*s.* 6*d.*—hence the paucity of business. Inferior pig was not much in demand; and as it will not suit the purpose of the pig masters to stack their make, it is most likely that furnaces will be blown out. Indeed it was stated that that proceeding is in contemplation in several instances. For *Shropshire* iron there was the usual steady demand. The meeting passed off cheerfully, considering the moderate amount of business done.

At *Dudley*, on the 16th, the attendance was small, and was confined principally to those who are engaged in the trade in the immediate locality. Very little finished iron of any description was sold. The feeling was much the same as at the *Birmingham* meeting—that although there will be no

declared reduction of prices, nevertheless before the quarter is half through many of the second-class makers will be glad to accept orders at fully 10s. per ton below the rates fixed by the trade. Some half-dozen or more of the principal firms are well supplied with orders, and in the event of their running short they will put their works on at three or four days as the only method of coping with the difficulty which the unprecedentedly high wages scale has brought upon the trade. The market for pig-iron was extremely dull; for hot-blast, all mine buyers would not give so much by 5s. per ton as they would have done three months ago. For cinder iron there was very little demand. The coal trade in this district was reported to be brisk, notwithstanding the advanced period of the season, when the demand for domestic purposes generally falls off.

At a meeting of the iron trade of the United Kingdom, held in London on April 28th, attended by its most influential members, resolutions to the following effect were unanimously adopted:—That this meeting, without any desire to interfere with the rights of the workmen to combine for any fair and legitimate object, is resolved to resist, by every means in its power, all attempts on the part of any combination of workmen to dictate to their employers the mode in which their work shall be conducted, and what workmen they shall employ; and, with a view to maintain this principle, a committee be formed representing every iron-making district.

DERBYSHIRE.—On April 5th an explosion of fire-damp, resulting in the death of two men, occurred at the *Church Gresley* pit, an extensive coal mine belonging to the Marquis of Hastings, five miles from Burton-on-Trent, and the same distance from Ashby-de-la-Zouch. The explosion is supposed to have occurred through one of the men taking a naked light into the "intake."

SOUTH YORKSHIRE.—The iron trade of this district has been in a very disturbed state, owing to the numerous "lock-outs" at the various iron-works, the number of men now out being estimated at over ten thousand. All the men at Low Moor Iron Works, amounting to five hundred, and those at Bowling, amounting to four hundred, have left work without any prospect of a speedy return. Various meetings have been held at Leeds and Bradford, at which it was decided to request the influential gentlemen of the district to mediate between the men and their employers. The cause of this "lock-out" is the refusal of the men to sign a declaration, as required by their employers, to withdraw from any trade societies to which they may be connected. All the great iron companies in the district have recently insisted upon their workpeople signing an agreement to this effect, as a means of getting rid, as is alleged, of the frequent interference of trade societies in the control and regulation of their various establishments.

SOUTH LANCASHIRE.—The coal trade has been characterised by the greatest activity. The facilities afforded by the extensive railway communications from the coal fields of Yorkshire and South Wales, on the east side of the Mersey, have considerably augmented this trade within the last few years. There has been a general demand for all kinds of coal, both for home consumption and for exportation.

The iron trade also has been in a very satisfactory condition. Considerable disappointment has been felt by many, on account of the Staffordshire ironmasters having decided to maintain present rates; and it is reported that several Liverpool houses have been holding back large American orders, in hopes of a reduction. The *Kirkless Hall* Coal and Iron Company have completed another furnace, so they now have five in full blast.

Messrs. Prentiss & Co.'s petroleum works at Birkenhead were partially destroyed by fire on April 4th. The fire occurred after the workmen had left the premises, but being immediately discovered prompt measures were taken, and a large quantity of petroleum removed.

NORTHERN COUNTIES. NORTH LANCASHIRE AND
NORTH YORKSHIRE.

NORTHUMBERLAND AND DURHAM.—The coal trade has been in much the same position for the past month as mentioned in our last, though there has not been on the whole such an active demand at the steam-collieries. Coke continues in increasing request and maintains its price, manufacturers having been pressed with orders. There is a good opening for trade with Cronstadt, but other foreign markets have been quiet. There have been great disturbances, as was feared, amongst the colliers at *Monkwearmouth* and at *Willington*, where they became quite riotous. There is also no improvement in the state of affairs at *Seghill*, the men still holding out against the reductions proposed by the owners. About one hundred and twenty of the men have left and gone to work at collieries at a distance, and those who remain are allowed 6s. a week by the union, and receive a good deal of help from their neighbours. At *Ryhope* colliery the yearly bond has not been insisted upon by the masters; the men will for the future work under monthly agreements.

It is stated that *Broad Oak* colliery, Loughor, is once more to be set in motion, under the direction of Mr. David Llewellyn, mining engineer, who is actively engaged in preparing for the erection of a powerful engine. It is also reported that the ground has been broken for a new colliery on the edge of *Birtley* common, between Newcastle and Durham.

On March 31st, an accident occurred at *West Moor* colliery, near Newcastle, by the connecting rod between the engine and fly-wheel breaking. Great damage was done to the machinery, but no lives were lost. There was also an accident on April 8th at the *Peggy* pit, Newbottle, near Durham, caused by an escape of gas from some old workings, which coming in contact with a light exploded and set fire to the coal.

Place and Owners.	In.	Out.	Total.
Eston—Bolekow and Vaughan	9	—	9
„ Clay Lane Company	3	—	3
„ South Bank Company	3	—	3
Cargo Fleet—Jones, Dunning and Co. ..	2	—	2
„ Cochrane and Co.	4	—	4
„ Gilkes, Wilson, Pease and Co. ..	5	—	5
Middlesborough—Bolekow and Vaughan ..	4	—	4
„ Hopkins and Co.	2	—	2
Port Clarence—Bell Brothers	5	1	6
Norton—Warner, Lucas and Barrett ..	3	—	3
Stockton—Holdsworth and Co.	3	—	3
Ferry Hill—J. Morrison	3	—	3
Thornaby—W. Whitwell and Co.	3	—	3
Darlington—South Durham Company ..	3	—	3
Witton Park—Bolekow and Vaughan ..	4	—	4
Stanhope—Weardale Iron Company	1	—	1
Towlaw—Weardale Iron Company	5	—	5
Consett—Derwent Iron Company	7	11	18
Total	69	12	81

The iron trade has been rather quiet, the unsettled state of affairs on the continent having limited the demand, and there has been some fear of prices falling so that buyers have been unwilling to give large orders. Still there is no falling off in the work, and all the men continue fully employed. The iron-masters in the North of England have intimated their determination to resist to the utmost a demand recently made upon them by the puddlers for an increase in the rate of payment the latter

have been receiving. The masters will assume that attitude because of late years there have been frequent advances in the puddlers' wages, and to increase them still further would render successful competition with foreign iron manufacturers impossible owing to the great cheapness of labour on the continent as compared with England. If the puddlers do not withdraw their demand all the ironworks are to be closed. The Cleveland iron trade is still steadily extending, and the table shows the state of the blast-furnaces up to April 15th.

The *Wreckhills* ironworks, recently offered at public auction by Mr. Thwaites, at Middlesborough, after slight competition, were purchased by Mr. G. Demaine, for the sum of 2700*l*. The *South Belmont* ironstone mines, near Guisbro', have been closed. The number of men employed, however, did not exceed fifty, all of whom found no difficulty in getting work in the district. Messrs. Fox, Head, and Co., are progressing rapidly with their works, and Messrs. Hopkins and Co. are erecting a new puddling mill, preparatory to an addition of about forty puddling furnaces to their present number. Messrs. Pease, Hutchinson, and Ledward have commenced rolling, and Messrs. Stevenson, Wilson, Jacques, and Co., and Messrs. Cooke, Bray, and Co., are preparing to proceed with their blast-furnaces immediately.

A prospectus has been issued of the *Consett* ironworks, with a capital of 400,000*l*. in shares of 10*l*., to take at a valuation, under the sanction of the Court of Chancery, extensive iron and coal works in the county of Durham, which were among the assets of the Northumberland and Durham District Bank at the time of its suspension in 1857, and which have since been carried on on behalf of the shareholders of that establishment. The amount to be paid is 295,318*l*., and the average profits of the last six years have been equal to 12*1*/₂%, although the iron trade during that period has been depressed. The *Bishopwearmouth* ironworks are also to be conducted by a limited company, with a nominal capital of 100,000*l*., in shares of 20*l*. each.

The exports from the Tyne include :—204,545 tons of coal ; 15,425 tons of coke ; and 53,332 cwts. of iron. The imports include :—three cargoes of sulphur pyrites from Dort, one from Cadiz, and one from Levanger ; cargoes of pyrites from Antwerp, Seville, Rotterdam, Levanger, and Bilbao ; 1,703 bars and 971 pigs of lead from Almeira ; 5,479 bars from Aguilas, 5,422 from Carthage, and 2,257 from Alicante ; ironstone from Cherbourg ; iron ore from Garrucha ; sulphur ore from Pomaron ; and copper from Stavanger.

SCOTLAND.

There has been a moderate amount of activity in the coal trade : the demand for export has been well maintained, and there has also been a fair request for coal for home use. The shipments from the various ports during the last few weeks show a considerable increase as compared with the corresponding period last year. Towards the end of March several of the colliery owners in the Ayrshire coal fields gave their men notice that there would be a reduction in their present rate of wages. Among these were Messrs. Horne and Messrs. Gilmour and Co. The men at once held large delegate meetings, and on each occasion declared their determination to resist the reduction. A result of the attitude of the men has been that, in the two cases above mentioned, the notice was withdrawn until the 1st of the next month.

At the beginning of the month makers were generally complaining of a slackness of orders in the iron trade, but it was hoped that the meetings of the Staffordshire ironmasters would give an impetus, which, however, has scarcely yet been realised. Orders have been given out sparingly, though the works have been fully employed. The *Gartness Malleable Iron works*,

which were in the market some time ago, are again being sought after, and there is reason to believe that they will be purchased by an English firm, who are at present on terms. One of the chief hindrances to the completion of the arrangement is the high rate of carriage which the Monkland Railway Company, who command the access to the works, are disposed to demand.

CONTINENT OF EUROPE AND MEDITERRANEAN COUNTRIES.

FRANCE.—Transactions have been limited at St. Dizier, in the iron trade, but still the works continue fully employed. Large orders have been received from the South. In the Moselle district there has not yet been a rise, but prices are very firm. The *Moyeuivre* works, it is understood, are about to resume the manufactures of rails, in order to meet the numerous engagements of the house of Wendel, and for the execution of which the resources of the Styring establishment are insufficient. The considerable stocks of *Noveant* have been run off, and it appears that another blast-furnace is about to be relighted. Only one blast-furnace is in activity at the *Hayange* works; the others are in course of demolition, but will be replaced by furnaces of greater capacity. A satisfactory state of affairs prevails in the Meurthe district. Pont-à-Mousson has disposed of a large quantity in the department of the Nord, and has engaged the production of one blast-furnace for a year; a third furnace is being constructed by the proprietors. Important engagements have been secured by MM. Frouard and Champigneulle, so that, having regard to the large production, the quantity at disposal is comparatively small. The Committee of Ironmasters, which was dissolved upon the death of M. Léon Talabot, has been reorganised by M. Schneider, of the Creuzot works.

The *Rive-de-Geer* Collieries Company has lately published its annual report, which is not so encouraging as former ones. The director, M. Imbert, has resigned, and has been succeeded by M. Allimand.

The production of the *Aubin* mines and works, conducted by the Orleans Railway Company, has made the following progress in the last three years:—

Year.	Coal.	Iron.
	Tons.	Tons.
1861	192,931	16,179
1862	226,007	17,260
1863	224,199	19,391

The profits realised by the company under this head, in 1863, were about 35,000*l.*, but the capital engaged was so considerable that this sum still left a deficit of 6,000*l.* to be made good on the interest account.

BELGIUM.—The iron trade at Charleroi may be said to be in a satisfactory position. The *Ougrée* Blast Furnace Company has concluded a contract for 6,000 tons of pig with an English house, and it is understood that the pig will be put to the test in several works in Wales. Other large contracts have also been undertaken, it is stated, by MM. Gustave Dumont & Co., of Châtelineau, and M. Edouard Bonnehil, of Marchienne-au-Pont.

The coal trade has somewhat recovered its activity, but in the Charleroi basin it is still very depressed.

The following are among the imports and exports into and from Belgium during the first two months of 1864, as compared with the corresponding periods of 1863 and 1862:—

Imports.

	1864.	1863.	1862.
	Tons.	Tons.	Tons.
Coal and coke	8,935	10,087	9,096
Rough copper.. ..	125	399	417
Iron ores	25,081	24,706	8,987
Rough pig and old iron ..	322	388	121
Lead	56	122	387
Zinc	766	614	479

Exports.

	1864.	1863.	1862.
	Tons.	Tons.	Tons.
Coal and coke	455,323	495,409	476,684
Rough copper	16	133	252
Iron ores	20,710	35,276	26,382
Rough pig and old iron ..	4,348	5,082	4,923
Lead	597	789	1,871
Rough zinc	1,658	2,476	3,683
Rolled zinc	1,864	1,362	1,339

SPAIN.—A meeting of the *Fortuna* Company was held in London at the beginning of April, when the report stated that the quantity of ore raised during the past six months was 2,241 tons, the quantity melted was 2,052, and the quantity of lead sold 1,520 tons; the profit is 4,428*l.*, being an increase of 1,094*l.* as compared with the previous six months. The mines are in a promising condition; good and productive ore ground is being opened at several new points.

The report of the *Linares* Company states that the quantity of lead sold during the six months ending December was 1,672 tons, being 590 tons less than were sold during the first half of the year. The profits, which amounted to 3,971*l.*, would have been larger but that the works still going on at Warne's mine were not completed.

The directors of the *Alamillos* Company have received advices that productive ground has been met with in that portion of the mine near Taylor's shaft, and that this shaft will now be sunk, and levels driven in new or unwrought ground, from which good returns may be expected.

PORTUGAL.—The annual general meeting of the *Lusitanian* Mining Company was held in London, on April 6th. The report stated that the profit on working the Palhal mine for the twelve months to September 30th has amounted to 1,411*l.*, which was somewhat more than sufficient to clear off the balance that remained in the previous accounts for the new drainage works, and to defray the further expenditure for the completion of the new machinery which has been subsequently incurred. The ore sold during the year has realised 14,696*l.* As regards Carvalhal mine, the report stated that every effort has been made during the past year to explore the lode to as great a depth as possible with the limited means at command, but the inclined shaft having been deepened four fms., the quantity of water met with increased so much as to render further progress without machinery impracticable.

ITALY.—It is reported that a new mine of nickel, copper, and cobalt has been discovered a few leagues from Turin, in the raised ground between Vin and Mezzenile.

NORTH AMERICA.

NEWFOUNDLAND.—Two mines are now worked on this island—one of lead and one of copper—each employing over 100 persons.

LAKE SUPERIOR REGION.—The *United States Railroad and Mining Register* publishes some statistics of the copper produce of this region for the years 1862 and 1863, which may be summed up as follows:—

				1863.	1862.
				Tons.	Tons.
Portage Lake District	..	..		4,104	3,942
Keweenaw District.	..	..		2,439	2,390
Ontonagon District	..	..		2,004	2,728
				8,547	9,060

showing a decrease in 1863 of 513 tons. The falling off has been entirely confined to the Ontonagon district, the other two showing an increase. In round numbers the quantity of rough copper produced by the Lake Superior mines since 1845, when mining was first regularly prosecuted there, amounts to 57,664 tons.

Reports state that mining at Keweenaw Point has every appearance of turning out successful. At *Copper Falls* a lode on the Etna belt has been opened producing large quantities of copper. *Girard* is reported to be looking well. At *Etna* the shaft is sunk and 200' opened each way in addition to the surface operations.

UNITED (ATLANTIC) STATES.—The miners in the Cumberland region, Maryland, have been following the example of our colliers here by striking for an advance of wages, to which the masters acceded after the men had left work four days. The coal trade in this district is looking very well.

An oil well has been struck on Bull Creek, West Virginia, which is reported to yield from 600 to 1,000 barrels per day.

Two new rolling mills are about to be erected in Allentown, Pennsylvania, both by joint-stock companies.

UNITED (WESTERN) STATES.—The Jackson salt-well, Michigan, is reported to be progressing exceedingly well, and has now reached a depth of 1,842'. They are now sinking in the lime rock, having just gone through a stratum of salt-bearing rock 45' thick, but which did not furnish sufficient volume of brine to engage in the manufacture of salt upon a large scale. It is expected that another stratum of salt-bearing rock will soon be reached.

CALIFORNIA AND BORDER TERRITORIES.—An important discovery of coal has recently been made near La Paz. This discovery will be of great value to the Colorado Copper Mines, scarcity of fuel having been the great drawback to them. Good results are reported to be received from the Monte Diablo copper mines, and also from the other mines in the neighbourhood.

Mining in the *Santa Fe* district, Rees River, is reported to be progressing satisfactorily. Two quartz mills and a saw-mill are about to be erected immediately.

The *Oregon* mill, ten stamps, is said to be obtaining good results from the "North Star" mine, which latter might be called a copper mine, if it were not more valuable in silver. The poor results of the mill in working the Oregon rock have induced the company to erect a roasting furnace for treating that ore. The attention of miners seems to be a good deal directed to the *Amador* district, from whence good reports are being received.

The winter in the *Humboldt* district has been very favourable for mining purposes, a great many companies have been constantly at work and the results have been very satisfactory. The Humboldt canal is reported to be progressing very well, when finished the water power furnished by it will be of material benefit to the Humboldt miners.

SOUTH AMERICA.

BRAZIL.—The directors of the *St. John del Rey Mining Company* have received the following report, dated Morro Velho, February :—Produce, 11 days of February, 9,502 oitavas ; yield, 4,691 oitavas per ton. Extra work on hand going on favourably.

The *Anglo-Brazilian Gold Company* have received accounts from Captain Treloar, which report that the produce for February amounted to 82 oitavas of gold of a high standard. This was extracted from the stone and rubbish sent up from the Gongo Mine. Very little of the actual lode had been treated.

The *Don Pedro North del Rey Gold Mining Company* have also received advices from Captain Treloar, which state that the gold return for February amounted to 1,728 oitavas, or 668 oitavas more than that for January, notwithstanding that February was a short month. This increase was due mainly to the fine weather having rendered the water in Bawden's Mine a trifle less, thereby enabling the men to raise a somewhat greater quantity of stone from the bottom of the mine.

The directors of the *Santa Barbara Gold Mining Company* have received advices from Captain Bryant, dated Pari, Feb. 27th, which state that since the last accounts the Ripples had been once cleared up, after stamping 20 tons of stone over them, which gave 58 oitavas of gold, equal to 2.9 oitavas per ton of stone. This was from shaft and bottoms mixed, exclusive of the adit level, the stone from the latter being kept separate for trial, the result of which will be given in the next report.

The directors of the *East del Rey Mining Company (Limited)* have received advices from their superintendent, Captain Wm. Treloar, dated Sabara, Feb. 27. At Capao Mine the works have been prosecuted with energy, and the horse whim kept day and night hauling ores, &c., from the mine. At Henderson's Shaft the lode has improved, ores of superior quality having been met with. At Emily Mine various points on the great lode are being explored, and some favourable examples have been taken.

The first issue of 50,000 shares in the *Rossa Grande Gold Mining Company* are reported to have been all applied for.

PERU.—The *Peruvian Silver Ore Reduction Company* has been inaugurated to work the refuse ores from eight of the celebrated silver mines of Huantajaya under a concession obtained from the Peruvian Government. The ore is lying at surface, and has only to be stamped and the silver extracted. It is estimated that the crushing of 30 tons per day will give 30,000*l.* per annum profit. The capital consists of 100,000*l.* working capital shares and 60,000*l.* vendor's shares, the latter not entitled to dividends until 10 per cent. has been paid on the former.

CHILE.—The *Copiapo Mining Company* have received the following advices :—At Checo Copper Mine the lode in the 60 fm. level east is a little improved. The lode in the winze sinking east at the 65 is not looking so well. The winze west at the 60 is again being sunk, in order to cut the same channel of ground as there is in the 50 and 40 winzes. The lode in the winze sinking west at the 50 is still looking very promising. Dulcinea Copper Mine: the produce for the month of January, 1,411 quintals, value 2,327 dollars.

AUSTRALASIA.

VICTORIA.—The directors of the *Port Phillip and Colonial Gold Mining Company* have received advices from their resident director, Mr. Bland, dated Cuneo, 23rd February last, giving the result of the months of January and February quartz crushing. There was but one fortnight's crushing during the month of January, when 1,779 tons of quartz were crushed, which yielded 893 oz. 3 dwts. of gold, being an average of 10 dwts. 1 gr. per ton. The receipts during January were 2,131*l.* 1*s.* 3*d.*, and the payments 2,251*l.* 8*s.* 11*d.* This was the first month for a very long period that the receipts did not meet the payments, there being a balance on the wrong side of 120*l.* 7*s.* 8*d.* This, however, is accounted for by the short period the stamps were at work, earning but a comparatively small sum during the whole month. The payment on account of stock of firewood was also heavy, amounting to over 900*l.* Return for February.—The quantity of quartz crushed during February was 3,266 tons; yield of gold, 1,460*l.* 18*s.* 2*d.*; ditto per ton, 8*22*. The new stamps have been got to work and are doing well.

A seam of coal about 4-feet thick is reported to have been discovered on the banks of one of the affluents of the Wannon, several miles from Coleraine.

SOUTH AUSTRALIA.—The *English and Australian Copper Company* have received advices from their manager, dated Port Adelaide, February 26th. The quantity of coal at Koorunga was 1,180 tons, at Kapunda 438 tons, and at Port Adelaide and afloat 671 tons. There were six furnaces and one refinery at work at the port, and one furnace under repair. Since the date of the last advices about 84 tons of copper had been shipped to England.

The *Kapunda Mining Company* have received advices to the same date. The quantity of ore raised in December last was 269 tons of 18½% average produce, equal to 49 tons of pure copper, exclusive of 20 tons of sulphur ore for flux. The quantity raised in January is estimated at about 350 tons wet weight of good percentage. All was going on steadily at the smelting works, the furnaces being in full work, and a good supply of fuel coming in. Since the date of the last advices, 68 tons of copper had been shipped.

The *Yudanamutana Mining Company* have received advices from their superintendent, dated Adelaide, February 25th, stating that the smelting of the poorer ores had been commenced, and with very satisfactory results. The progress made with the traction engines was very slow, the wad requiring much more cutting and levelling than had been anticipated. Blinman mine was looking well, and a new lode had been cut in No. 2 shaft. After smelting 10 tons of ore to galinate the furnace it had been found necessary to stop in order to line the stack with bricks.

The *Worthing Mining Company* have received advices from the Bremer Mine, dated February 26th, which state that the mine continued to improve. The lode in the 53 south of Legg's engine shaft was of large size, and yielding a good quantity of ore. The furnaces were again at work, and wood coming in fast. Ore raised and dressed during the month, 270 tons, of the average quality; expenses, 1,203*l.* 12*s.* 9*d.*

The *Wheel Ellen Mining Company* have received advices to the same date. Mr. Alfred Hallett, the company's manager, reports that every endeavour is being made to push on the underground operations as fast as possible. Bassett's shaft was all but ready for drawing water; a difficulty had occurred from the crushing of the ground, otherwise the water would have been out ere the date of advices; but Mr. Hallett expected to start the engine on the 1st of March, and before next mail to give some account of the reserves below the water level. The result in smelting the undressed ores by the dry process appeared to justify the opinion that they could be so dealt with. Six tons of a mixture of ores yielded five pigs of lead, sample of the first tap giving 166 oz. of silver, and 2 oz. of gold to the

ton of pig lead. The evidence being so strong in favour of the process, preparations were made to make another trial on a larger scale.

A special meeting of the *Great Northern Copper Mining Company* of South Australia was held on April 7th, to consider the advisability of voluntarily winding up the undertaking; but, after some discussion, it was decided to adjourn for six weeks, to allow of the receipt of further advices from the mines, which, it is hoped, may prove more encouraging than those hitherto to hand. Those last received state that the only work now going on was the sinking of the engine shaft at Nuccaleena.

At the annual general meeting of the *Scottish Australian Company*, the directors' report stated that, subsequent to May last, every practicable effort has been continued to bring the copper mines, and the colliery which the company were working, into a productive and paying condition; and the directors have every reason to hope that these objects are in a fair way of being early realised, as regards both these important undertakings. With regard to the Lambton Colliery, the report stated that, in October last, the railway was completed, the coal waggons had been put together, arrangements for shipping the produce of the colliery at the port of Newcastle were made, and the company began to send in coal there for shipment. As regards the smelting works, it stated that the ore from the three mines, it is anticipated, would enable the manager to complete, early in February last, a total of 124 tons of fine copper since the commencement of smelting operations.

WESTERN AUSTRALIA.—The advices from the *Fortune* mining company state that all the works are being pushed forward. The sinking of the shaft goes on rather slowly owing to the hardness of the ground. The production of lead ore is increasing.

NEW SOUTH WALES.—A new coal seam has been found at *Hartley*, near Bathurst, and altogether the Hartley coal-field is reported to be opening up well, only requiring a railway to develop it into an immense source of wealth.

The *Newcastle Chronicle* publishes Government returns showing the coal trade of the port for the last five years. Previous to 1861 the only coal companies in the Newcastle district were the Australian Agricultural, the Coal and Copper, the Miumi and the Tomago. Since that period the Tomago pits have ceased working, but the following new collieries have come into the market, namely, the Wallsend, Waratah, Lambton, and Co-operative. The following are the shipments:—

Years.	Foreign.		Coastwise.	Total.
	Tons.		Tons.	Tons.
1859	179,453	128,319	307,772	
1860	174,298	132,160	306,458	
1861	170,880	126,076	296,956	
1862	239,810	127,613	367,423	
1863	229,856	141,464	371,320	

The foreign shipments last year were distributed as follows:—

To Victoria, 106,629 tons; South Australia, 33,791 tons; New Zealand, 43,332 tons; China, 15,520 tons; Tasmania, 10,861 tons; Queensland, 192 tons; Ports in Pacific, 1,302 tons; Guam, 250 tons; India, 400 tons; Java, 3,493 tons; Manilla, 1,134 tons; Mauritius, 400 tons; Panama, 240 tons; Petropaulovski, 435 tons; South America, 700 tons; Tahiti, 400 tons; United States, 10,577 tons; total, 229,856 tons. Within the the last two years competition has reduced the price of coal in the Newcastle market fully 5s. per ton.

NEW ZEALAND.—Coal has been discovered near the camp at Ratun, Pokeka. It is reported to be of the anthracite kind, very suitable for steam purposes, and superior in heating power for the American Stoves to the Newcastle and Nelson coal.

INDIA.

A vein of coal or lignite, said to be inexhaustible, has been opened in the Punjab. It has been tried by the Punjab Railway Company for its locomotives, the chief engineer pronouncing most favourably on it. The discovery has caused considerable interest in the Punjab; for, if it prove to be, as it is described, of a quality equal if not superior to that found in Bengal, it will secure the profitable working of an extension of the railway in the Punjab. The discovery of this vein has been made at Pind Dadun Khan, about 150 miles northward from Lahore, on the banks of the Jhelum, a little to the west of the ordinary road to Peshawur, and contiguous to Mr. Andrews's projected line between Lahore and Peshawur. The Lieutenant-Governor of the Punjab, with Colonel Maclogan and Professor Oldham, has gone to investigate the quality and quantity of this coal.

Record of the Mining and Metal Markets.

METALLIC-ORE MARKETS.

TIN.—The tin standard has been twice reduced since our last, 2*l*. on the 14th, and another 2*l*. on the 22nd, and now stands at:—

Superior Fine	..	£105	....	Superior Common	..	£101
Second Fine	..	103	....	Second Common	..	100

This drop of 11*l*. per ton in the standard in two months has had a very depressing effect on the Cornish tin mines, of course rendering a reduction in dividends inevitable.

COPPER.—At the four Cornish sales we give this month the number of tons, average produce, quantity of fine copper, average price per ton, and standard have been as follows:—

Date.	Tons.	Produce.	<i>Fine</i> Copper. Tons. cwt.	Price per ton.	Standard.
Mar. 24. ..	3,606	6½ ..	223 12	£5 1 0	£125 18 0
„ 31. ..	3,417	6½ ..	228 13	5 11 0	124 2 0
April 7. ..	1,872	6½ ..	122 15	5 11 0	126 10 0
„ 21. ..	4,057	6½ ..	247 6	4 19 0	126 9 0

As an example of the utter worthlessness and uncertainty of the system at present in use for calculating the real variation of the copper standard from the mythical standard given in the ticketing papers, to which we have more than once referred, we may call attention to the following wholly irreconcilable statements of the *West Briton* and *Mining Journal* as to the variations in the standard at the first three of the sales we give

above. At the sale of the 24th the standard slightly advanced according to the *West Briton*, but according to the *Mining Journal* it advanced 10s. At the sale of the 31st there was a slight advance according to the *West Briton*, but according to the *Mining Journal* the standard remained stationary. At the sale of April 7th, the *West Briton* reports an advance of 1*l.* 15s., but according to the *Mining Journal* the advance was 5*l.* At the sale of the 21st, they agree in reporting a decline of 4*l.*

LEAD.—Comparing this month's prices with those of last we find that an advance has been made.

COAL MARKETS.

LONDON, *March 29th*.—From the returns of the Registrar of the London Coal Exchange, of the quantity of sea-borne coal, culm, and cinders, imported into London in the month of March, we learn that the total quantity was 288,324 tons, against 288,429 tons during the corresponding month of last year,—showing a decrease of 105 tons.

The following are the particulars of the 288,233 tons imported during February:—

Newcastle .. 104,090 tons in 231 ships	Scotland .. 1,550 tons in 8 ships
Seaham .. 18,666 " 74 "	Wales .. 5,939 " 19 "
Sunderland .. 84,696 " 205 "	Yorkshire .. 1,300 " 9 "
Middlesbro' .. 8,762 " 26 "	Small .. 1,937 " 3 "
Hartlepool.. 58,739 " 207 "	Cinders .. 1,259 " 11 "
Blyth .. 1,370 " 5 "	

The quantity of coal imported by railways and canals during the month of March was 187,781 tons, against 158,022 tons in the corresponding month of last year,—showing an increase of 39,759 tons.

On March 30th, the new ships arrived were 33; there was an animated inquiry for house-coal which advanced from 3*d.* to 6*d.* per ton; Hartleys in request at an advance of 9*d.*; Hetton Wallsend, 18s. 6*d.*; South Hetton Wallsend, 19s. 6*d.*; Haswell Wallsend, 19s.; Tees Wallsend, 18s.; Braddyll's Wallsend, 17s. 9*d.*; Eden Main, 18s. 9*d.*; Belmont Wallsend, 16s. 6*d.*; Heugh Hall Wallsend, 16s. 6*d.* On April 1st, new ships 21; market quiet. On the 4th, new ships 31; house-coal in good demand. Hartley's dull and fallen 3*d.* On the 6th, new ships 45; business brisk at an advance of 1s. per ton. On the 8th, the 13 arrivals were all steamers. On the 11th, 21 fresh arrivals, which were nearly all steamers; a steady business was done. On the 13th, new ships 23; market active. On the 15th, new ships 80; business quiet. On the 18th, new ships 16; not much doing. On the 20th, new ships 28; house-coal reduced 3*d.* to 6*d.* per ton. On the 22nd, new ships 59; a large supply of coal in the market, some of which sold at a reduction of from 3*d.* to 6*d.* per ton. On the 25th, new ships 47; a moderate amount of business done with a fall of 1s.; Hartley's receded 3*d.* On the 27th, new ships 62; increased dullness in the market, with a further decline of 6*d.* Hetton Wallsend, 18s. 6*d.* per ton; South Hetton Wallsend, 18s. 6*d.*; Braddyll's Wallsend, 17s. 6*d.*; Eden Main, 17s.; Harton Wallsend, 16s. 6*d.*; and Framwellgate Wallsend, 16s. 3*d.* per ton; 38 cargoes unsold—40 ships at sea.

LIVERPOOL.—From Messrs. J. and T. Platt's Coal Circular for February, we find that the quantity of coal, cannel, coke, and patent fuel shipped from Liverpool to foreign and colonial ports during the month of March was 59,955 tons, against 36,349 tons during the corresponding month of last year—showing an increase of 23,606 tons. The exports coast-wise during March were 10,468 tons, against 7,168 tons during the same

month last year—showing an *increase* of 3,282 tons. The total exports coastwise from January to March, were 28,682 tons, against 19,769 tons during the corresponding period of 1863—showing an *increase* of 8,913 tons.

CONTRACTS FOR COAL.—The Admiralty require the supply of 8,000 tons of South Wales coal, and 4,000 tons of North of England coal, to be delivered at Malta; 3,200 tons of coal to be delivered at Simon's Bay, Cape of Good Hope, two-thirds of which are to be South Wales coal, and the remainder North of England coal; and 600 tons of South Wales coal to be delivered at Valparaiso.

SHARE MARKETS.

LONDON, April 28th.—The London share market opened firm, with an upward tendency in prices during the first week, but after that it was dull, and at times prices were rather unfavourable. On the 11th, the market was dull, and from that time till the 15th, little business was transacted on account of the fortnightly settlement. Since the 15th, the market has been very quiet, and transactions rather restricted. On the 28th, the chief feature in the market was a strong demand for Great Wheal Vor shares. The dulness of the prices of metals and the stringency of the money market may be expected to have a still further unfavourable effect.

Advanced.

Wheal Seton	£5	Great North Downs	£3½
East Lovell	9½	Wheal Rose	3½
South Caradon	5	Nanjiles	3
Herodsfoot	4	Pendeen	1
North Shepherds	1	East Russell	slightly
Wheal Grenville	1½	Great Laxey	2½

Declined.

West Seton	£5	South Frances	£10
Great Wheal Vor	3½	Wheal Basset	2½
West Wheal Metal	1	Clifford Amalgamated ..	5
East Caradon	1	Tincroft	slightly
Marke Valley	1½	Stray Park	3
West Caradon	slightly	Cook's Kitchen	1
West Chiverton	5	Prosper United	1½
Wentworth Consols	1	Hingston Down	slightly
Wheal Mary Ann	1	South Tolgus	4
East Basset	4	Bryn Gwiog	4

Wheal Seton shares opened lower on the 30th at 190*l.*-195*l.*, but on the 1st recovered to their closing price of last month, 192½*l.*-197½*l.*, at which they remained until the 4th, when they rose to 195*l.*-200*l.*, and again on the 8th, to 197½*l.*-202½*l.* On the 11th, they were still better at 200*l.*-205*l.*, and on the 12th shares had reached their highest price of 200*l.*-210*l.* *ex div.* After that date they declined, and close at 197½*l.*-202½*l.* *West Seton* shares have declined to 200*l.*-210*l.* *North Roskear*, 24*l.*-26*l.* *North Crofty*, 4½*l.*-5*l.*

The principal advance during the month has been in *East Lovell* shares. On the 30th they opened at 10½*l.*-10½*l.*, and from that date up to the present they have steadily risen and leave off at 19*l.*-19½*l.* *Great Wheal Vor* shares have been weak, and have declined in price. They opened on the 30th at 37*l.*-38*l.*, and declined by the 22nd to 30½*l.*-31½*l.* Since then they have rallied and close a little better at 33½*l.*-34½*l.* *Wheal Margery* shares have improved to 6*l.*-7*l.* *Great Wheal Fortune*, 15*l.*-16*l.*

Providence, 41l.-43l. *Wheal Basset and Grylls*, 15l.-16l. *Wheal Grylls*, 25l.-27l. *Wheal Kitty* (Ielant), 13½l.-14½l. *East Grylls*, 13l.-14l. *East Providence*, 4½l.-4¾l. *Wheal Margaret*, 18½l.-19½l. *Great Wheal Grylls*, 4l.-4½l. *Grylls Wheal Florence*, 3l.-3½l. *Sithney Carnmeal*, 6½l.-6¾l. *Sithney Wheal Metal*, 5l.-5½l. *West Wheal Metal*, 4l.-4½l. *East Wheal Tor*, 5½l.-5¾l. *East Great Grylls*, 12l.-13l.

East Caradon shares have again slightly declined during the past month. They opened on the 30th at 31½l.-31¾l., and on the 1st improved 15s. From the 6th, however, they have been lower, and close at 29½l.-30½l. *Marke Valley* shares have been dull, and have receded from their opening quotation of 6l.-6½l. to their closing one of 4½l.-5½l. There has been an improvement of 5l. in *South Caradon* shares, which were last quoted at 45½l.-46½l. *Glaspor Caradon*, 3½l.-4½l. *West Caradon*, 20l.-21l. *South Caradon Wheal Hooper*, 10s.-12s. *Caradon Vale*, 3½l.-3¾l. *Gonamena*, 3½l.-4l.

There has been a slight decline in *West Chiverton* quotations, which opened on the 30th at 60l.-85l., and close at 75l.-80l. *Herodsfoot* shares opened on the 30th at 32l.-34l., and rose on the 1st to 35l.-37l., but declined on the 4th to 35l.-36l. at which they remained until the 26th, when they recovered and rose to 36l.-38l., at which they close. *Wentworth Consols* shares close lower at 15l.-17l. *Wheal Mary Ann* shares also close lower at 11½l.-12½l. There has been some movement in *North Shepherd's* shares, which opened at 4½l.-4¾l., and close at 5½l.-6l. *Wheal Ludcott and Wrey*, 2½l.-2¾l. *Wheal Trelawny*, 23l.-24l. *Wheal Chiverton*, 12l.-12½l. *Wheal Hope*, 4l.-4½l. *Chiverton Moor*, 5½l.-5¾l. *North Chiverton*, 2l.-2½l. *Cargoll*, 36l.-37½l. *Chiverton Valley*, 5l.-5½l. *Great Retallack*, 9s.-11s.

A considerable amount of business has been done in *Wheal Grenville* shares, which at one time had advanced upwards of 3l. They opened on the 30th at 8½l.-8¾l., and advanced up to the 15th to 11½l.-12l. They have, however, receded slightly since, and leave off at 10l.-10½l. *East Basset* shares have been rather depressed. They opened on the 30th at last month's closing quotation of 69l.-71l., and have steadily declined to 65l.-67l. *East Grenville* shares have been firm, and have advanced 10s. from 2½l.-3½l., to 3½l.-3¾l. *South Frances* shares have gone back 10l. since they were last mentioned in February, and are now quoted at 40l.-50l. The lease of this mine expires early in May, and there may be some difficulties in its renewal in consequence of the litigation with *West Basset*. On the 1st business was done in *Wheal Basset* shares at 85l.-90l., being a reduction of 5l. upon our last prices, but at the end of the month they were quoted 87½l.-92½l. *North Basset*, 1¾l.-2l. *Copper Hill*, 11l.-12l. *South Grenville*, 10s.-12s.

Great Wheal Busy shares which were last month quoted at 5½l.-5¾l., are now quoted at 4½l.-5l. The sett having been subdivided, the part taken away now called *Hallenbeagle*, is quoted separately at 3½l.-3¾l. *Wheal Rose* shares have been firm and have advanced from 47½l.-52½l. to 54l.-56l. *Great North Downs* shares have been more dealt in in the market this month, not having been quoted for some months. They opened at 4l.-4½l. and close at 6l.-6½l. *Clifford Amalgamated* shares have been dull at 31l.-32l. *Nanjiles* shares have improved to 33l.-34l. *St. Day United*, 39s.-41s.

Tincroft shares have again declined a little, probably in sympathy with the fall in tin. They opened on the 30th at 18½l.-19½l., and close at 18l.-18½l. *Stray Park* shares opened on the 30th at 30l.-32l. On the 4th they advanced to 34l.-36l., but have not maintained this price, closing at 31l.-33l. *Cook's Kitchen* shares have been dull at 20l.-21l. *Condurroir*, 100l.-195l. *South Condurroir*, 25s.-27s. *Carn Camborne*, 7s. 6d.-10s.

Little has been done in *New Rosecarne* shares, which close at their opening price, although at one time they had declined to 8l.-10l. *Prosper United* shares have been quiet. They were quoted at 7l.-7½l. in

the early part of the month, but have since gone down to 5½l.-5¾l. There has been a slight improvement in *Pendeen* shares, which were last quoted at 6l.-6½l. *Wheal Unity*, 5s.-7s. 6d. *West Trevelyan*, 4s.-6s. *Wheal Kitty* (St. Agnes), 7l.-7½l. *East Rosewarne*, 2½l.-2¾l. *Treloweth*, 2½l.-2¾l.

East Russell shares have been quiet at 4l.-4½l. *Drakewalls*, 35s.-37s. *Wheal Crebor*, 44s.-46s. *New Martha*, 1l.-1½l. *Hingston Down*, 3½l.-4l. *Wheal Edward*, 33s.-35s. *Bedford United*, 2½l.-2¾l. *Gawton*, 1l.-1½l. *South Tolgus* shares have declined from 40l.-45l. to 37½l.-40l. *East Carn Brea*, 6½l.-7l. *Wheal Uny*, 6½l.-6¾l. *South Carn Brea*, 10s.-20s. *Great South Tolgus*, 3l.-3½l. *North Downs*, 1¼l.-1½l. *North Treskerby*, 2½l.-3½l.

In Welsh and other outlying mines prices have been quoted as follows :—*Bryn Gwiog*, 30l.-32l. *Prince of Wales*, 4s.-6s. *Rhymney Iron*, 29½l. *Great Lazeby*, 7l.-7½l. *United Merthyr Collieries*, 10s.-20s. prem.

Among foreign and colonial mines, transactions have been reported as follows :—*Cape Copper* shares have not changed much in prices. They leave off at 12½l. *St. John Del Rey* shares have recovered 2l., their closing price being 48l. *Nova Scotia Gold and Land* shares opened on the 30th at 1¾l.-1½l., and have gone up to 2½l.-3l. *Fortuna*, 4l.-4½l. *United Mexican*, 6½l.-6¾l. *Panulcillo*, 1¾l. *Worthing*, 17s. 6d. *Yudanamutana*, 3½l.-2½l.-3l. *Don Pedro North Del Rey*, 10s.-12s. 6d. *Port Phillip*, 1¾l. *Copapo*, 5½l. *English and Australian Copper*, 1¾l. *Pontigbaud*, 7½l.-8l. *Cobre Copper*, 34½l. *Montes Aurores*, 2¾l. *Peel River Land and Mineral*, 45l. *Alamillos*, 17s. 6d.-20s. *Anglo-Mexican Mint*, 21½l.-21¾l. *Linares*, 6½l. *Quebrada Land and Mining*, 3l. *Mariquita*, 12s. 6d. *Gellivara*, 5l.-5½l. *Rossa Grande*, 5s.-10s. prem. *British Copper*, 10s.-15s. prem. *General*, 21l. *Australian*, 17s. 6d. *Anglo-Brazilian Gold*, 5s.

Among new undertakings this month, *Great South Chiverton*, shares have been quoted at 2½l.-2¾l. *Mineral Bottom*, 7l.-7½l. *New Devon*, 1l.-2l. prem. *East Great Grylls*, 12l.-13l. *East Wheal Vor*, 5½l.-5¾l.

CORNWALL.—During the early part of the month very great activity was shown in the Cornish mining share market, but the dullness in the copper standard has rather restricted business in some of the principal copper mines. *Wheal Seton* shares have been firm at 202l.-205l. *Great Wheal Fortune* shares quiet at 15l.-16l. *Great North Down* shares have been largely dealt in at 4¾l.-5l. *Nanjiles* shares have improved to 32½l.-34½l. *Sithney Carnmeal*, 6l.-6½l. *Prosper United*, 5½l. *Copper Hill*, 9l.-10l. *East Carn Brea*, 7½l.-8l. *Wentworth Consols*, 16l.-17l. *Wheal Rose*, 52l.-54l.

BIRMINGHAM.—*Muntz's Metal* shares were last quoted at 1l. dis.

LEEDS.—*Cape Copper*, 7½l. prem. *Yudanamutana*, 3l.-5l. 16s.

MANCHESTER.—*Gartell Gold*, 2s. 6d. dis.

LIVERPOOL.—*Copapo and Caldera*, 146l. x. d.

NEWCASTLE-ON-TYNE.—The mining market here has shown some activity. The principal shares dealt in have been *Mineral Bottom*, *Wentworth Consols*, *Chiverton*, *North Crofty*, *Grenville*, *Great Wheal Vor*, and *West Chiverton*, *Troed-y-rhiw* shares at one time advanced from 2s. 6d. to 12s. 6d., and close steady at 5s.-7s.

DUBLIN.—For the last few weeks little attention has been paid to mines on the Irish market in consequence of the various new schemes absorbing so much attention. *Mining Company of Ireland* shares have receded to 22½l. *General Mining Company of Ireland* shares 4l. *Wicklow Copper*, 12½l.-12¾l. *Connorree*, 18. 6d. *Carysfort*, 15s. 6d.-16s.

SAN FRANCISCO, *March 4th*.—Mining stocks in general have had a declining tendency during the past month, and transactions seem to have been mainly confined to speculative shares.

Gold and Curry shares have declined considerably and are last quoted at \$4,650 to \$4,660. A dividend of \$125 per foot has been declared. *Chollar* shares have improved to \$375. *North American* shares seem to have attracted most attention, a large number of shares having changed hands. Prices have been as high as \$145 but close at \$110. *Lady Bryan* shares have declined to \$50. *Burning Moscow* shares have been considerably dealt in; prices have been up to \$112½ but close lower at \$108. *North Potosi* shares are reported to have been in demand, some having changed hands at \$70. *Ophir* shares have been more dealt in and prices have advanced to \$1,610 to \$1,650. A good deal of business is reported in *Real del Monte*, a large number of shares having changed hands at \$35 to \$42½. *Baltic* \$60 to \$75. *Yellow Jacket* \$950 to \$975. *Uncle Sam* \$825. *Pride of the West* \$85 to \$95. *Harmon* \$29 to \$32. *Melones* \$42. *Central American* \$5. *Sierra Nevada* \$85.

METAL MARKETS.

LONDON, *April 28th*.—The metal market has been characterised by great dullness throughout the month, and there does not yet seem to be any sign of improvement. Very few orders of importance have been given out, and prices close even lower than they have been for the last two or three weeks.

IRON.—The market for this metal was quiet at the beginning of the month, and but few orders were received, as buyers were in hopes that a reduction in prices would be made at the quarterly meetings of the Staffordshire ironmasters. Such, however, has not been the case, and the market has assumed a rather more favourable tone. The demand for America continues good.

Scotch pig-iron has not fluctuated much, but improved a little in price towards the end of the month. It opened on the 30th at 58s. 3d., and fell slightly on the 31st, but was again quoted at 58s. 3d. cash on the 1st. On the 6th, prices improved to 58s. 10½d.-59s., and after little variation close at 60s. cash.

Welsh bars have been very dull. The last prices quoted were 7¾l. 8l. in Wales. Staffordshire descriptions unaltered. Swedish iron maintains its position.

COPPER.—This metal has continued heavy, and a further reduction of 5l. per ton was reported on the 11th, making present prices 105l. for manufactured, 98l. for cake and tile, and 101l. for best selected, but it may be easily obtained for 2l. or 3l. less. In foreign, little business has been done. *Burra Burra*, and *Kapunda*, nominally 100l.; *Chili*, 90l.

TIN.—Sales in this metal have been effected with difficulty, and the market for it continues much depressed. Foreign has declined. *Straits*, 109l.; *Banca*, 112l. It is stated that the *Dutch Trading Company* intend for the future to hold quarterly sales of *Banca*, commencing in June next.

TIN PLATES.—There has only been a moderate amount of transactions in this article, and prices have tended in buyers' favour.

LEAD has been steady at good prices. Common English 21¾l., L.B. 22l., W.B. 23l.

SPELTER.—In consequence of the large importation of this metal, there has been a serious decline in the market for it. Sales on the spot 20¾l.-21l.; forward 21l.-21½. Hull parcels close firmer at 21l. cash, and 21¼l. forward.

STEEL remains inactive.

GLASGOW, *April 28th*. IRON.—The Scotch pig-iron market showed considerable firmness at the beginning of the month, but declined towards the middle in consequence of the dearth of money. It has since recovered itself, and assumed a firmer tone. Prices opened firm on the 30th at 58s. 3d. cash, three months open. No. 1 G.M.B., 57s. 9d.; No. 3, 57s. 3d., and continued so, with a good demand until the 9th, when a moderate business was done at 59s. 1½d. cash, 59s. 6d. one month. G.M.B., No. 1, 58s. 9d.-57s. 9d. No. 1, Gartsherrie, 63s.; Coltness, 62s. 6d.; Calder, 61s.; Eglinton, 58s.; Glengarnock, 59s. 6d.; Kinniel, 57s. 6d.; Carron, 58s. There has been on the whole a strong market ever since, and prices close at 59s. 9d. cash, sellers; buyers, 59s. 7½d.; No. 1, G.M.B., 59s. 3d.; No. 3, 58s. 6d.

PARIS, *April 26th*.—The market for COPPER has been very dull owing to the flatness in the English market. English 247½ fr. Lake Superior 315 fr.

TIN has been very quiet. Banca, 305 fr. Straits, 295 fr.

SPELTER has receded from 58½ fr. to 57 fr.

COLOGNE, *April 25th*.—There is nothing new to report in the metal market since our last, although things generally seem rather improved. LEAD remains firm, and SPELTER is somewhat flatter.

AMSTERDAM, *April 24th*. TIN.—Banca has been dealt in at 67½ fl. COPPER has been held nominally at 57 fl. LEAD has been quoted higher.

HAMBURG, *April 23rd*.—Business generally has been very quiet, and prices mostly nominal.

IRON.—Scotch pig 2½ mk. Iron in bars 6½ to 6¾ mk. Staffordshire descriptions 7½ to 7¾ mk.

COPPER.—In spite of the reduction in prices little has been done in this metal.

TIN remains without change. Banca in blocks, 13 sch. English in blocks, 12½ sch.

SPELTER.—This article remains very quiet with little business done.

STETTIN, *April 23rd*. IRON.—Pig-iron has been very firm at 52 to 52 sgr.

COPPER is quoted at 34 to 37 thlr.

TIN, Banca, 42 to 43 thlr.

BERLIN, *April 23rd*.—The metal market has been without animation during the past month, and only a very limited amount of business has been transacted.

IRON.—Bar iron has been dealt in at 3½ to 4 thlr. Staffordshire descriptions 5½ thlr.

COPPER remains exceedingly quiet. Paschkoff 40 thlr. Demidoff 38 thlr. English and Swedish 33 thlr.

TIN has had no demand, and prices are merely nominal. Banca 41 thlr.

LEAD has been firm at 6½ to 7½ thlr.

HONGKONG, *March 1st*.—LEAD, 1,040 pigs; common, \$6.20 to \$6.40; best, \$6.40 to \$6.60.

IRON.—Sales, 4,500 piculs; nail rod, \$2.50 to \$2.60; hoop, \$3 to \$3.20; bar, \$2.50 to \$2.60.

SHANGHAI, *February 23rd*.—LEAD, 5 2 taels; IRON (nail rod), 1 8 to 2 2 taels; tin, 25 to 26 taels.

SHANGHAI, *March 8th*.—Prices unaltered,

Furnished by Von Dadelzen and North, 158, Leadenhall Street, London, E.C.

There has been no improvement in the metal market since our last report. Holders have been more inclined to meet the demand of operators at prices lower than those ruling during the month previous.

IRON.—Welsh bars, although nominally unchanged, have been very dull, and it was with difficulty sales were made at makers' prices. Rails have been rather dearer. Staffordshire iron in buyers' favour. The Scotch pig-iron market opened at 58s. 9d. cash, and 60s. 3d. open, and advanced to 60s. cash and 61s. 6d. open, since which, however, it has relapsed 3d. per ton.

COPPER.—This metal has been unusually dull this month. On the 11th instant the smelters reduced the price 5l. per ton, but second-hand parcels of English continue to be offered under official prices. Foreign quite nominal, and nothing reported.

TIN has been much depressed, and the sales that have taken place have been at lower prices. We quote Straits 108l. to 109l. Banca has been sold at 110l. English continues to be offered under fixed prices.

TIN PLATES have been firm. **LEAD** is slightly lower, but in fair demand for export.

SPELTER.—This market opened steady at 21l. 5s. to 21l. 7s. 6d. for spot and forward, but declined to 20l. 10s. spot; since which, however, there has been a rally, and business has been done at 21l. 5s. to 21l. 10s. spot, 21l. 10s. for July, August. Hull parcels held at 21l. 10s.

THE BOARD OF TRADE RETURNS.

The "Accounts relating to Trade and Navigation of the United Kingdom, for the month ended 29th February, 1864, and two months ended 29th February, 1864," have been issued by the Statistical Department, Board of Trade.

IMPORTS.—The quantities and relative increase and decrease of the imports of metals, metallic ores, and mineral products, for the month and two months ended 29th February, have been as follows:—

	Month ended 29th February.			Two Months ended 29th February.		
	1863.	1864.	Increase (+) or Decrease (—)	1863.	1864.	Increase (+) or Decrease (—).
Brimstone cwt.	100,120	41,315	— 58,805	117,538	53,954	— 63,584
Copper Ore tons	4,558	5,868	+ 1,310	8,796	10,359	+ 1,563
Copper Regulus "	2,136	182	— 1,954	4,312	2,209	— 2,103
Copper, unwrought and part wrought cwt.	17,300	42,620	+ 25,320	20,480	49,900	+ 29,420
Iron, in Bars, unwrought, tons	634	1,806	+ 1,172	1,155	3,977	+ 2,822
Steel, unwrought "	88	176	+ 88	101	619	+ 518
Lead, Pig and Sheet "	1,993	3,515	+ 1,522	2,605	4,151	+ 1,546
Spelter or Zinc "	1,165	2,929	+ 1,764	1,891	4,121	+ 2,230
Tin, in Blocks, Ingots, } Bars, or Slabs cwt.	3,118	1,639	— 1,379	3,118	1,639	— 1,479
Silver Ore value in £	18,590	38,170	+ 19,580	26,640	39,070	+ 12,430
Petroleum tons	830	2,765	+ 1,935	1,327	2,808	+ 1,481
Pyrites tons	9,275	6,363	— 2,912	12,017	9,275	— 2,742
Quicksilver lbs.	166,171	453,035	+ 286,864	166,171	453,035	+ 286,864

EXPORTS.—The quantities, declared value, and relative increase and decrease of the exports of metals, minerals, and metallurgical articles of British and Irish produce and manufactures, for the month and two months ended 29th February, have been as follows:—

LONDON PRICES CURRENT OF METALS.

From Messrs. JAMES and SHAKESPEARE'S, 10, Austin Friars, E.C., 28th April.

		Per Ton.	
IRON	{ Rails in Wales ..	£7 10 0	@ £7 15 0
Welch	{ Bars	—	7 15 0
	{ "	8 15 0	" 9 0 0
	{ "	10 0 0	" 10 10 0
Staffordshire ..	{ Nail Rods	10 0 0	" 10 10 0
	{ Hoops	11 0 0	" 11 10 0
	{ Sheets	12 0 0	" 12 10 0
Scotch	{ Pig (mixed Nos. warrants) in the Clyde	2 19 0	" 2 19 0
	{ "	12 10 0	" 12 15 0
Swedish	{ Iron { Large sizes	12 10 0	" 13 0 0
Hammered	{ Indian assortments ..	12 10 0	" 13 0 0
	{ Steel { Faggot	17 0 0	" 17 10 0
	{ In kegs (½ and ⅔ in.) ..	—	" 16 0 0
		Per Unit.	
COPPER	Ore	—	@ 17s. 6d.
	Regulus	—	" 17s. 6d.
	Barilla	18s. 6d.	" 19s. 0d.
		Per Ton.	
	Chili Slab (for 96% pure Copper)	—	none —
	Spanish Cake	£92 0 0	@ £94 0 0
Australian ..	{ Burra and P.C.C.	—	" 101 0 0
	{ Kapunda	102 0 0	" 103 0 0
	{ Wallaroo	—	" 101 0 0
American....	{ Baltimore	—	none —
	{ Lake Superior	—	—
	{ Tough Cake and Ingot and Tile ..	—	@ 98 0 0
English	{ Best selected Ingot	—	" 101 0 0
	{ Sheets, Sheathing and Rod	—	" 105 0 0
	{ Flat Bottoms	—	" 110 0 0
		Per lb.	
YELLOW METAL..	Sheets	8½d.	@ 8½d.
	Sheathing and Rod	8½d.	" 9½d.
		Per Cwt.	
TIN	{ Common Blocks and Ingots	110s.	@ 112s.
English ..	{ " Bars (in barrels)	111s.	" 113s.
	{ Refined	115s.	" 117s.
	{ Straits, Fine	—	" 109s.
Foreign ..	{ " (with 3 months' prompt)	111s.	" 112s.
	{ Banca	—	" 114s.
		Per Box.	
TIN PLATES	Charcoal IC, best	30s. 0d.	@ 31s. 0d.
	" IX "	31s. 0d.	" 37s. 0d.
	Coke IC	24s. 0d.	" 26s. 0d.
	" IX	30s. 0d.	" 32s. 0d.
		Per Ton.	
LEAD.....	{ Sheet	£21 17 6	@ £22 0 0
English ..	{ Pig—W.B.	—	" 23 0 0
	{ " Other good brands	21 15 0	" 22 0 0
Foreign ..	{ German and Spanish, soft ..	—	" 21 0 0
	{ Red	—	" 23 0 0
English ..	{ Shot	—	" 24 0 0
	{ Dry White	—	" 26 10 0
SPELTER	{ (Silesian) in Cakes	—	" 21 10 0
ZINC	{ (Sheet) No. 9 and upwards	—	" 25 0 0
		Per Bottle.	
QUICKSILVER	(in bottles containing 75lbs. each)	8 15 0	@ 9 5 0
		Per Ton.	
REGULUS OF ANTIMONY, French Star		36 0 0	@ 37 0 0

Tabular Abstract of Mining Accounts for the Month.

Date of Account.	Name of Mine, and Number of Shares.	Balances.		Calls.		Dividends.	
		Debit.	Credit.	Per Share.	Total.	Per Share.	Total.
		£ s. d.	£ s. d.	£ s. d.	£ s. d.	£ s. d.	£ s. d.
CORNISH & DEVON MINES.							
Mar. 21	Emily Penrietta (1,024)	—	96 15 0	0 10 0	512 0 0	—	—
" 22	North Gribbler (1,366)	—	—	0 12 6	853 15 0	—	—
" 22	South Tolgus (512)	—	250 0 0	—	—	—	—
" 23	West Basset (6,000)	—	1,985 13 9	—	—	0 5 0	1,500 0 0
" 23	Drakewalls (12,800)	—	1,335 0 0	—	—	—	—
" 23	Tywarnhaile (6,000)	—	—	0 7 6	2,250 0 0	—	—
" 23	Goonzion (2,000)	577 7 11	—	0 5 0	500 0 0	—	—
" 23	Wheal Reeth (240)	315 2 4	—	—	—	—	—
" 24	Devon Great Consols (1,024)	—	38,275 8 11	—	—	10 0 0	10,240 0 0
" 24	East Jane (6,145)	—	129 6 4	0 2 6	768 2 6	—	—
" 24	East Russell (4,000)	—	—	0 3 6	700 0 0	—	—
" 24	Wheal Edward (4,096)	462 0 0	—	0 4 0	819 4 0	—	—
" 24	Okel Tor (4,096)	75 0 0	—	—	—	—	—
" 28	Durlo (1,000)	320 5 0	—	—	—	—	—
" 28	Copper Hill (1,024)	—	64 15 3	—	—	—	—
" 29	South Caradon (512)	—	6,288 12 8	—	—	6 0 0	3,072 0 0
" 29	New Rosewarne (1,024)	476 4 7	—	—	—	—	—
" 29	East Basset (512)	—	1,569 7 6	—	—	2 0 0	1,024 0 0
" 29	West Wheal Vor (4,096)	—	—	1 0 0	4,096 0 0	—	—
" 29	Rosewall Hill & Ransom (6,000)	129 0 2	—	—	—	—	—
" 30	Cradock Moor (1,055)	—	1,124 18 10	—	—	—	—
" 30	Bedford Consols (4,000)	21 10 7	—	0 1 0	200 0 0	—	—
" 30	Wheal Agar (6,000)	40 0 0	—	0 4 0	1,200 0 0	—	—
" 30	Clijah and Wentworth (787)	—	—	0 10 0	393 10 0	—	—
" 30	Wheal Crelake (12,000)	1,947 16 4	—	0 3 0	1,800 0 0	—	—
" 30	New Wheal Lovell (2,048)	507 4 7	—	1 0 0	2,048 0 0	—	—
" 31	Gonamena (6,144)	—	388 1 9	0 2 0	614 8 0	—	—
April 1	Wheal Sarah (1,500)	—	10 12 3	0 1 6	112 10 0	—	—
" 2	Furze Hill Wood (6,000)	304 15 11	—	0 1 6	450 0 0	—	—
" 5	Birch Tor & Vitifer (6,000)	—	1,650 0 0	—	—	0 2 6	750 0 0
" 5	Great Retallack (6,000)	421 2 7	—	0 2 0	600 0 0	—	—
" 5	Wheal Basset (512)	—	2,221 4 0	—	—	1 10 0	768 0 0
" 6	East Caradon (6,144)	—	8,817 17 3	—	—	1 2 6	6,912 0 0
" 6	Marke Valley (9,000)	—	650 10 0	—	—	0 1 0	450 0 0
" 6	Carn Camborne (6,000)	116 11 4	—	0 2 6	750 0 0	—	—
" 6	West Rose Down (1,000)	—	99 13 2	0 15 0	750 0 0	—	—
" 6	Wheal Kitty (Lelant) (1,024)	—	—	—	—	0 7 6	384 0 0
" 7	South Seton (400)	625 1 11	—	3 0 0	1,200 0 0	—	—
" 7	East Seton (5,610)	—	282 17 2	—	—	—	—
" 7	North Crofty (5,610)	314 19 6	—	0 1 6	420 15 0	—	—
" 11	Basset and Grylls (1,000)	—	335 9 1	—	—	—	—
" 11	Dolcoath (358)	—	3,641 5 8	—	—	8 0 0	2,864 0 0
" 11	Wheal Seton (386)	—	2,755 0 0	—	—	4 0 0	1,584 0 0
" 12	West Seton (400)	—	2,010 4 8	—	—	4 0 0	1,600 0 0
" 12	Bedford United (4,000)	—	508 3 11	—	—	0 2 6	500 0 0
" 12	Wheal Grylls (1,024)	—	305 2 2	—	—	—	—
" 12	Great Grylls (3,072)	—	1,768 6 10	—	—	—	—
" 12	East Grylls (2,048)	288 4 7	—	—	—	—	—
" 12	Wheal Arthur (5,990)	—	—	0 1 0	299 10 0	—	—
" 12	North Robert (6,144)	—	—	0 2 6	768 0 0	—	—
" 12	Treworlis (2,048)	1,406 0 5	—	1 0 0	2,048 0 0	—	—
" 14	East Bottle Hill (6,000)	126 2 4	—	0 0 6	150 0 0	—	—
" 15	Great South Chiverton (6,900)	—	—	0 10 0	3,000 0 0	—	—
" 15	Devon and Cornwall United (4,076)	1,972 4 2	—	0 10 0	2,038 0 0	—	—
" 15	East Falmouth (2,048)	419 8 10	—	0 5 0	512 0 0	—	—
" 18	South Crofty (937)	819 0 0	—	0 15 0	702 15 0	—	—
" 18	South Herodsfoot (1,024)	123 4 4	—	0 10 0	512 0 0	—	—
" 19	Wheal Pollard (6,000)	428 15 7	—	0 2 0	600 0 0	—	—
" 20	Clifford Amalgamated (2,900)	—	1,588 4 6	—	—	0 10 0	1,450 0 0
" 20	West Caradon (1,024)	—	1,699 17 10	—	—	—	—
" 20	East Ellen (1,300)	126 10 0	—	0 2 6	162 10 0	—	—
" 20	East Providence (3,986)	—	1,143 6 2	—	—	—	—
" 21	Great South Tolgus (6,000)	1,082 19 6	—	0 5 0	1,500 0 0	—	—
" 21	Wheal Hearle (3,656)	138 2 2	—	—	—	—	—
" 22	East Carn Brea (6,000)	—	285 17 7	—	—	—	—
WELSH & OTHER MINES.							
Mar. 30	Cwm Erfin (867)	—	—	—	—	0 15 0	646 5 0
" 31	Dale (35,000)	—	494 5 6	—	—	—	—
April 1	Foxdale (2,800)	—	—	—	—	1 0 0	2,800 0 0
" 21	Bronfloyd (5,000)	—	1,344 5 6	—	—	0 2 6	625 0 0

Copper Ores,

Sampled March 8, and sold at Tabb's Hotel, Rodruith, March 24.

Mines.	Tons.	Pur-chasers.	Price.	Mines.	Tons.	Pur-chasers.	Price.
Great Wheal Busy.....	53	9	£2 6 0	West Caradon.....	44	1, 6	£10 5 0
89	6		2 11 6	27	9		4 15 6
78	2, 3		3 1 6	57	5		5 15 0
69	1		1 8 0	North Treaskerby.....	55	5, 6	3 10 6
59	7		4 4 0	54	3, 6		4 3 0
40	1		3 14 6	49	2		4 3 6
37	1		2 17 0	48	6		6 0 6
33	7		4 15 6	47	3		4 18 0
2	7		36 16 6	Wheal Rose.....	102	3, 6	4 18 6
South Caradon	101	2	5 8 6	60	7		7 5 6
76	3		5 5 0	50	7		6 7 0
77	1, 6		18 18 6	45	3		6 5 0
52	1		7 13 6	43	2, 4, 6		7 0 0
52	1, 2		14 17 0	Glasgow Caradon	60	9	5 2 6
36	8		1 16 6	48	9		4 11 0
35	1, 7		5 18 6	42	10		2 3 6
24	2		6 17 6	North Downs	41	6	6 13 0
Phoenix Mines	109	2	3 0 6	40	3		6 5 0
72	6, 9, 12		2 13 6	37	3		5 17 0
65	1		3 1 6	24	3		1 16 6
61	1		3 6 6	Wheal Polmear	59	7	6 7 6
53	7		2 17 6	40	12		4 17 6
47	5, 7		2 14 0	33	1, 6		10 17 0
30	6		5 4 0	St. Day United	53	4, 6	4 11 0
Clifford Amalgamated	90	1	1 9 6	32	12		1 12 6
65	5		4 7 0	25	12		1 7 6
62	5		2 6 6	Craddock Moor	54	1	6 8 6
55	5		2 6 6	46	5		6 8 0
52	5		3 1 0	Boscawen.....	57	12	2 18 6
49	3, 7		2 12 6	37	2		8 8 6
19	6, 7		4 15 0	Gonamena	45	10, 12	2 19 0
18	5		7 0 0	18	1		15 17 0
17	5		4 3 0	South Crinnis	25	9	2 10 0
West Caradon.....	68	1	9 1 6	Wheal Prudence	18	1	2 13 6
63	9		4 19 0	Trevethan's Precipitate ..	3	1	41 10 0
61	7		6 3 0	Jenkin's Precipitate ..	2	5	18 10 0
57	6		7 14 0	Paynter's Precipitate ..	1	5	19 4 6

TOTAL PRODUCE AND VALUE.

	Tons.	Amount.		Tons.	Amount.
Great Wheal Busy	500	£1,522 6 0	St. Day United	110	£327 10 6
South Caradon	464	3,977 9 0	Craddock Moor	100	641 7 0
Phoenix	445	1,473 18 0	Boscawen	94	423 9 0
Clifford Amalgamated	427	1,261 11 0	Gonamena	63	418 1 0
West Caradon	320	2,322 18 6	South Crinnis	25	63 10 0
North Treaskerby	310	1,421 16 0	Wheal Prudence	18	48 3 0
Wheal Rose	300	1,829 13 0	Trevethan's Precipitate	3	124 10 0
Glasgow Caradon	150	617 5 0	Jenkin's Precipitate	2	37 0 0
North Downs.....	142	782 18 0	Paynter's Precipitate	1	19 4 6
Wheal Polmear.....	132	927 14 0			

EACH COMPANY'S PURCHASE.

	Tons.	Amount.		Tons.	Amount.
1 Vivian and Sons	634½	£4,362 15 6	9 Copper Miners' Co.	280	£1,009 1 6
2 Freeman and Co.	313½	1,539 13 2	10 Charles Lambert	64½	157 14 6
3 Grenfell and Sons	488½	2,614 10 3	11 Newton, Keates & Co.	—	—
4 Crown Copper Co.*	—	—	12 Sweetland, Tuttle & Co. 210½	607 18 6	
5 Sims, Williams & Co.	518	1,954 11 9	13 Penclawdd Copper Co.	—	—
6 Williams, Foster & Co.	591½	3,706 17 10			
7 Mason and Elkington	469	2,220 6 6	Total	3,606	£18,239 3 6
8 Bankart and Sons	36	65 14 0			

Average Produce, 6½.

Quantity of Fine Copper, 223 tons 12 cwt.

Average Standard

Average Price per ton

* The purchases made by No. 4 (Crown Copper Co.) are included in the total of No. 6 (Williams, Foster & Co.), those firms being identical.

Copper Ores.

Sampled March 16, and sold at Tyack's Hotel, Camborne, March 31.

Mines.	Tons.	Pur- chasers.	Price.	Mines.	Tons.	Pur- chasers.	Price.
Clifford Amalgamated	88	7	£3 12 6	East Pool	26	9	£2 7 0
	82	6, 9	4 6 6		25	9	2 7 0
	76	3	5 11 6	Wheal Bassett	76	5	4 13 6
	73	3	6 11 6		58	6	5 14 0
	68	7	4 9 6		39	1	8 10 6
	66	12	4 3 6	South Frances	41	6, 7	6 7 6
	64	3, 6, 7	11 6 6		36	6	5 8 6
	59	7	6 2 6		25	9	6 6 0
	57	9	4 9 0		20	2	6 8 0
	51	3, 5	11 11 6		4	8	3 8 6
	50	8	11 14 0	South Tolgus	66	3, 4, 6	4 1 6
	27	1	4 6 6		47	7	9 4 0
	23	6	5 3 6	East Bassett	50	1	8 10 6
(Consoles)	67	3	11 9 6		28	5	5 5 0
Wheal Seton	32	9	4 9 6		18	5	5 4 0
(Pendarves)	128	10	1 4 0	Dolcoath	57	6	5 6 0
	100	6	4 9 6		38	2	5 5 0
	97	2	5 10 6	West Tolgus	87	2, 6, 7, 9	4 19 0
	70	6	6 1 6		8	8	0 9 0
	15	3, 5	14 6 0	Tincroft	57	12	3 1 0
West Seton	82	6	4 19 6		16	7	7 19 6
	66	2	6 18 0	South Crofty	29	3	2 13 0
	64	9	3 2 6		26	13	6 18 6
	62	9	4 7 6		17	9	1 4 6
	60	1	8 0 6	Molland	60	5	5 14 0
	50	1	8 9 6	Condurrow	47	2, 6	3 16 0
	48	1	11 4 6		9	2	5 15 0
Fowey Consols	84	1, 6	6 18 6	Bampfylde	34	1	9 6 6
	82	1, 5	1 13 0	Stray Park	22	1	4 1 6
	80	1	6 6 6	Camborne Vean	22	3	2 12 6
	74	5	5 12 0	South Bassett	16	6	3 6 6
	50	1, 5	5 7 0	Carn Camborne	8	5	2 13 0
East Pool	69	12	4 8 6		7	3	4 18 0
	53	1, 6	4 14 0	Michell's Ore	2	3	6 8 0
	43	9	8 12 0	Davey's Ore	1	12	5 15 0
	41	5	2 13 0				

TOTAL PRODUCE AND VALUE.

	Tons.	Amount.		Tons.	Amount.
Clifford Amalgamated	850	£5,671 7 6	Tincroft	73	£301 9 0
Wheal Seton	442	1,919 19 6	South Crofty	72	277 14 6
West Seton	432	2,778 13 0	Molland	60	342 0 0
Fowey Consols	370	1,879 18 0	Condurrow	56	230 7 0
East Pool	257	937 14 6	Bampfylde	34	317 1 0
Wheal Bassett	173	1,018 7 6	Stray Park	22	89 13 0
South Frances	128	730 17 6	Camborne Vean	22	57 15 0
South Tolgus	113	701 7 0	South Bassett	16	53 4 0
East Bassett	96	668 17 0	Carn Camborne	15	55 10 0
Dolcoath	95	501 12 0	Michell's Ore	2	12 16 0
West Tolgus	90	422 0 0	Davey's Ore	1	5 15 0

EACH COMPANY'S PURCHASE.

	Tons.	Amount.		Tons.	Amount.
1 Vivian and Sons	518	£3,710 0 0	9 Copper Miners' Co.	413	£1,581 1 3
2 Freeman and Co.	263	1,492 11 9	10 Charles Lambert	128	153 12 0
3 Grenfell and Sons	439	2,366 15 9	11 Newton, Keates & Co. ...	—	—
4 Crown Copper Co. * ..	—	—	12 Sweetland, Tuttle & Co. .	193	760 9 6
5 Sims, Williams & Co. ...	404	2,085 19 3	13 Penclawdd Copper Co. .	26	180 1 0
6 Williams, Foster & Co. .	682	3,611 14 0			
7 Mason and Elkington ..	341	2,024 12 6	Total	3,417	£18,981 18 0
8 Bankart and Sons	7	15 1 0			

Average Produce, 6½.

Quantity of Fine Copper, 228 tons 13 cwt.

Average Standard£124 2 0

Average Price per ton5 11 0

* The purchases made by No. 4 (Crown Copper Co.) are included in the total of No. 6 (Williams, Foster & Co.), those firms being identical.

Copper Ores.

Sampled March 23, and sold at Tabb's Hotel, Bedruth, April 7.

Mines.	Tons.	Purchasers.	Price.	Mines.	Tons.	Purchasers.	Price.
West Basset	72	7	£4 4 6	Par Consols	80	1, 6	£8 0 6
69	1, 6	10 13 6		32	1, 9	3 13 6	
68	11	5 4 6		Rosewarne Consols ...	42	2	7 13 0
43	1, 6	10 10 6		38	4, 6	9 1 6	
32	1, 2	8 7 6		29	3	5 17 6	
28	3	4 7 0		Copper Hill	66	10	2 8 0
26	12	3 18 0		33	5	6 12 0	
1	5	25 9 0		Pendeen Consols	60	4, 6	2 16 6
Prosper United.....	90	5	2 17 6	26	5, 12	1 12 6	
80	5	2 0 6		43	7	6 14 6	
66	2, 5, 7, 9	5 16 0		20	5	9 12 0	
51	8	3 12 6		19	12	2 3 0	
34	5	5 19 6		Great South Tolgus...	47	9	7 15 6
Carn Brea	60	1, 6	8 6 6	28	6, 7	9 0 0	
55	9	3 6 6		Rosewarne United ...	44	2	3 6 0
54	11	4 7 0		22	1	10 13 6	
44	7	5 15 6		Wheal Buller	54	4, 6	3 5 0
43	7	3 19 0		New Rosewarne	35	1, 6	7 2 6
40	7	8 14 0		South Dolcoath.....	21	5	7 17 6
East Carn Brea	74	3	4 8 6	South Carn Brea	20	7	4 1 6
39	3	4 18 0		Camborne Consols ...	10	3	5 7 6
32	2	5 12 6		Pembroke	2	2	3 4 0

TOTAL PRODUCE AND VALUE.

	Tons.	Amount.		Tons.	Amount.
West Basset	339	£2,366 0 0	Great South Tolgus.....	75	£617 8 6
Prosper United	321	1,191 11 6	Rosewarne United	66	380 1 0
Carn Brea	296	1,689 4 6	Wheal Buller.....	54	175 10 0
East Carn Brea	145	698 11 0	New Rosewarne	35	249 7 6
Par Consols	112	759 12 0	South Dolcoath	21	165 7 6
Rosewarne Consols.....	109	836 10 6	South Carn Brea	20	81 10 0
Copper Hill	99	376 4 0	Camborne Consols	10	53 15 0
Pendeen Consols.....	86	211 15 0	Pembroke	2	6 8 0
Charlotte United.....	82	522 0 6			

EACH COMPANY'S PURCHASE.

	Tons.	Amount.		Tons.	Amount.
1 Vivian and Sons	197½	£1,717 13 3	9 Copper Miners' Co.	134½	£702 16 0
2 Freeman and Co.	152½	882 12 0	10 Charles Lambert.....	66	158 8 0
3 Grenfell and Sons	180	865 3 6	11 Newton, Keates & Co.	122	590 4 0
4 Crown Copper Co. *	—	—	12 Sweetland, Tuttle & Co.	58	163 7 6
5 Sims, Wiliyams & Co. ...	308½	1,341 7 0	13 Penclawdd Copper Co.	—	—
6 Williams, Foster & Co. ...	309½	2,105 17 3			
7 Mason and Elkington ...	292½	1,668 10 6	Total.....	1,872	£10,380 16 6
8 Bankart and Sons	51	184 17 6			

Average Produce, 6½.
Quantity of Fine Copper, 122 tons 15 cwt.

Average Standard £126 10 0
Average Price per ton 5 11 0

NO SALE ON APRIL 14.

* The purchases made by No. 4 (Crown Copper Co.) are included in the total of No. 6 (Williams, Foster & Co.), those firms being identical.

Copper Ores.

Sampled April 6, and sold at the Royal Hotel, Truro, April 21.

Mines.	Tons.	Pur- chasers.	Price.	Mines.	Tons.	Pur- chasers.	Price.
Devon Great Consols	141	3, 5	£4 8 0	Marke Valley	80	4, 5, 8	£2 15 6
	139	6	5 6 6		78	4, 6, 12	2 4 6
	138	5	5 5 0		70	4, 6	2 16 6
	137	5	4 16 0		62	7	2 9 0
	131	5	5 11 0		34	4, 6	7 2 6
	128	5	5 11 6	Devon and Cornwall	102	12	1 17 0
	127	6	5 16 0		88	1	1 17 6
	123	3, 9	5 8 6		80	3	3 2 0
	121	7, 9	6 6 0		30	3	7 0 0
	120	2, 6	6 16 6	Bedford United.....	102	4, 6	4 8 6
	118	3	4 10 0		98	7	4 14 0
	116	3	5 16 0	Brookwood	62	1, 9	3 13 6
	114	8	2 10 6		55	1	1 17 6
	108	10	2 19 6		30	1	8 12 6
	106	9	3 6 6	Wheal Friendship ...	80	1, 6	8 4 6
	61	2	15 4 0		50	1	9 13 6
	58	7	5 14 0	Yarner	92	10	2 11 0
	32	1	14 9 0	Gunnis Lake Clitters	48	7	6 18 0
East Caradon	89	12	3 18 6		42	9	6 10 6
	86	10	4 0 6	North Wheal Robert	50	4, 6	5 1 6
	84	8	4 1 6		14	9	1 14 6
	81	9	4 12 6	Wheal Arthur	55	6	2 2 0
	67	4, 6	7 4 6	Sortridge Consols.....	27	1	4 4 6
	55	1, 13	8 9 6		18	1	5 8 6
	26	1	17 8 6	Fursdon	22	1	3 5 6
Marke Valley	82	4, 6, 7	3 10 6				

TOTAL PRODUCE AND VALUE.

	Tons.	Amount.		Tons.	Amount.
Devon Great Consols...	2,018	£11,054 2 0	Yarner	92	£234 12 0
East Caradon	488	2,815 13 0	Gunnis Lake Clitters.....	80	605 5 0
Marke Valley	408	1,276 10 0	North Robert	64	277 18 0
Devon and Cornwall ...	300	811 14 0	Wheal Arthur	55	115 10 0
Bedford United	200	911 19 0	Sortridge Consols	45	211 14 6
Brookwood	147	589 14 6	Fursdon	22	72 1 0
Wheal Friendship	130	1,141 15 0			

EACH COMPANY'S PURCHASE.

	Tons.	Amount.		Tons.	Amount.
1 Vivian and Sons	446½	£2,885 16 9	9 Copper Miners' Co.	896	£1,853 19 0
2 Freeman and Co.	249	2,050 6 0	10 Charles Lambert	286	902 1 0
3 Grenfell and Sons	476	2,305 12 9	11 Newton, Keates & Co. ...	—	—
4 Crown Copper Co.*	—	—	12 Sweetland, Tuttle & Co.	217	595 17 6
5 Sims, Williams & Co. ...	476½	2,419 7 0	13 Penclawdd Copper Co. ...	27½	233 1 3
6 Williams, Foster & Co. ...	904	4,416 7 0			
7 Mason and Elkington ...	353½	1,751 16 0	Total	4,067	£20,118 8 0
8 Bankart and Sons	224½	704 3 0			

Average Produce, 6½.
Quantity of Fine Copper, 247 tons 6 cwt.

Average Standard £126 9 0
Average Price per ton 4 19 0

* The purchases made by No. 4 (Crown Copper Co.) are included in the total of No. 6 (Williams, Foster & Co.), those firms being identical.

Copper Ores.

Sampled March 16, and sold at Swansea, April 5.

Mines.	Tons.	Pro-duce.	Pur-chasers.	Price.	Mines.	Tons.	Pro-duce.	Pur-chasers.	Price.
Berehaven	72	10½	9	£9 2 6	Knockmahon ...	99	11½	9	£10 9 6
	100	10½	7	9 11 6		183	12½	2, 7	11 2 6
	58	10½	6, 7	9 10 0	Lisbon	57	23	3	21 1 6
	80	10½	6, 7	9 10 0	Spanish	40	5½	10	4 9 6
	64	10½	7	9 13 0	British Regulus...	24	53½	5	49 4 0
	102	10½	9, 13	9 9 6		20	42½	3	38 10 0
	117	10½	2, 7	9 9 0	Dhurode	17	4½	1, 35	3 13 0
	101	10½	6	9 10 0	Crookhaven	6	3½	14	3 0 6
	114	10½	1, 6	9 9 0		2	5½	5	4 5 0
Knockmahon ...	130	11½	10	10 11 0	Copper Ore	14	9½	1	8 10 0
	134	12½	6	10 19 0					

TOTAL PRODUCE AND VALUE.

	Tons.	Amount.		Tons.	Amount.
Berehaven	905	£7,652 0 0	British Regulus	44	£1,950 16 0
Knockmahon	54½	5,911 14 0	Dhurode	17	62 1 0
Lisbon	57	1,199 17 0	Crookhaven	8	26 13 0
Spanish	40	179 0 0	Copper Ore	14	119 0 0

EACH COMPANY'S PURCHASE.

	Tons.	Amount.		Tons.	Amount.
1 Copper Miners' Co.	76½	£675 6 8	10 Bankart and Sons	170	£1,560 10 0
2 Freeman and Co.	150	1,570 15 3	11 Charles Lambert	—	—
3 Grenfell and Sons	82½	1,990 10 8	12 Ravenhead Copper Co.	—	—
4 Crown Copper Co.	—	—	13 Sweetland, Tuttle & Co.	51	483 4 6
5 Sims, Wiliams, & Co.	31½	1,209 19 8	14 Jennings & Co.	6	18 3 0
6 Vivian and Sons	361	3,620 19 0	15 Penclawdd Copper Co.	—	—
7 Williams, Foster & Co.	383	3,801 7 3			
8 British and Foreign	—	—	Total	1,584	£17,101 1 0
9 Mason and Elkington ...	222	2,177 5 0			

Black Tin Sales.

Dates.	Mines.	Tons c. q. lbs.	Price per ton.	Purchasers.	Amount of Money.
Mar. 5.	Great Work	13 6 2 7	£ 75 0 0	Daubuz Co.	999 12 2
" 18.	Wheal Par	2 7 1 4	69 10 0	ditto	164 6 4
" 19.	Penhalls	5 11 1 14	—	—	373 2 0
" 21.	Prosper United	4 14 2 9	65 10 0	Mellancar	373 19 4
" 22.	Great Work	15 8 3 22	71 10 0	J. Gatley & Co.	1,112 3 6
" 24.	Gurlyn	3 2 3 10	63 0 0	Chyandour	197 18 6
" 26.	Wheal Eliza	10 13 0 8	66 0 0	Enthoven & Sons	703 2 9
" 27.	North Jane	1 10 3 14	62 7 6	—	94 5 10
" 29.	Furze Hill Wood ...	4 17 2 19	66 17 6	Harvey & Co.	332 18 1
" 30.	Leeds and St. Aubyn ..	3 13 2 13	66 0 0	ditto	242 18 6
" 31.	St. Day United	40 8 0 20	—	—	2,365 13 1
"	Pendeen Consols ...	4 18 3 19	64 5 0	Bolitho & Sons	621 19 1
"	"	4 14 2 21	64 5 0	Michell & Co.	—
"	Prosper United	3 12 2 20	65 0 0	Bolitho & Sons	292 13 6
"	"	1 1 1 7	53 0 0	ditto	—
"	Great Wheal Busy ...	16 9 2 7	—	—	966 6 10
"	St. Just United	21 6 3 9	—	—	1,454 0 0
April 7.	New Birch Tor	12 2 2 19	—	Enthoven & Sons	808 15 6
" 9.	East Wheal Lovell ...	9 16 0 12	—	—	629 0 0
" 14.	Great Wheal Vor ...	43 12 1 22	—	—	3,070 4 7
" 16.	Polbreen	3 0 1 24	65 15 0	—	201 16 0
"	Penhalls	5 16 0 7	—	—	390 19 8
"	Wheal Par	2 12 2 19	68 5 0	Redruth Co.	179 14 8
" 19.	Trevenen	7 19 2 24	71 5 0	Enthoven & Sons	620 19 4
"	"	1 0 2 10	50 10 0	ditto	—

Copper Ores.

Sampled March 30, and sold at Swansea, April 19.

Mines.	Tons.	Pro-duce.	Pur-chasers.	Price.	Mines.	Tons.	Pro-duce.	Pur-chasers.	Price.
Cobre	104	12	3	£10 15 0	Knockmahon.....	136	10	1, 13	£8 18 0
	96	12	3	10 13 0		200	12	6	10 12 0
	88	12	5	10 12 6	Laxey	127	5	3	4 10 0
	93	10	7	10 9 6	Connorree Ore ...	69	3	1, 6	2 10 0
	98	12	6	10 12 0		47	3	1, 6	2 10 0
	61	24	5	20 10 0	(Precipitate) 5	36	3		30 0 0
(Precipitate) 16	57	5		45 12 0	Moonta	54	12	3	11 1 0
(Regulus) 33	43	2, 7		37 18 0	Copper Slag	25	3	5	1 15 0
	30	43	7	37 6 0	New Cornwall ...	36	19	2	16 16 6
Berehaven	98	10	7	9 6 6	Cape Copper.....	70	20	1	23 9 6
	122	10	2, 7	9 7 0		21	19	9	17 3 6
	113	10	2, 7	9 9 6	Burnt Ore	46	3	10	1 15 6
	60	10	2, 7	9 7 0		111	3	1	2 19 0
Knockmahon ...	45	12	1	10 14 6	Liverpool Slag ...	76	2	5	0 17 6

TOTAL PRODUCE AND VALUE.

	Tons.	Amount.		Tons.	Amount.
Cobre	619	£9,436 13 6	Copper Slag	25	£43 15 0
Berehaven	393	3,686 4 6	New Cornwall	36	605 14 0
Knockmahon	381	3,813 0 6	Cape Copper.....	91	2,003 18 6
Laxey	127	571 10 0	Burnt Ore	157	409 2 0
Connorree	121	440 0 0	Liverpool Slag	76	66 10 0
Moonta	54	596 14 0			

EACH COMPANY'S PURCHASE.

	Tons.	Amount.		Tons.	Amount.
1 Copper Miners' Co.	352	£3,203 10 6	10 Bankart and Sons	46	£81 13 0
2 Freeman and Co.....	181	2,438 15 10	11 Charles Lambert	—	—
3 Grenfell and Sons	386	3,458 12 0	12 Ravenhead Copper Co.	—	—
4 Crown Copper Co.	—	—	13 Sweetland, Tuttle & Co. 106	962	1 10
5 Sims, Williams & Co.	266	3,025 7 0	14 Jennings & Co.	—	—
6 Vivian and Sons	356	3,303 16 0	15 Penclawdd Copper Co.	—	—
7 Williams, Foster & Co.	366	4,638 12 4			
8 British and For. Copper Co.	—	—	Total	2,080	£21,673 2 0
9 Mason and Elkington	21	360 13 6			

Sundry Copper Ore Sales.

Dates.	Mines.	Tons.	Price per ton.	Purchasers.	Amount of Money.
			£ s. d.		£ s. d.
Mar. 21.	Lot 1 (ex Rambler).....	33	7 17 6	J. Keys & Son	576 19 0
	2 (ditto)	33	7 17 6	Newton, Keates & Co	
	2 (ex E. Anglian).....	6	8 4 0	J. Keys & Son	
	Brada United (ex Emma).....	23	5 2 0	ditto	256 11 0
	ditto	5	7 7 0	Newton, Keates & Co	
	(ex Spy)	20	5 2 6	ditto	
April 14.	Okel Tor	99	1 19 6	Landore Cop. Works	418 3 3
	"	16	0 18 0	Richard & Glasbrook	
	"	98	2 11 6	ditto	
" 15.	Gawton	22	6 10 6	C. Lambert	2,870 0 0
" 19.	Parys	160	—	Mona Co.	
	"	160	—	C. Lambert	
	"	140	—	Mona Co.	

Blende Sales.

Dates.	Mines.	Tons c. q.	Price per ton.	Purchasers.	Amount of Money.
			£ s. d.		£ s. d.
Mar. 4.	East Wheal Ellen.....	25 2 2	—	—	26 16 0
April 1.	Minera	80 0 0	5 5 9	W. Kenrick	608 15 0
	"	28 0 0	5 6 9	ditto	
	"	12 0 0	3 0 6	H. Southern	

Lead Ore Sales.

Dates.	Minea.	Tons.	Price per Ton. £ s. d.	Purchasers.	Amount of Money. £ s. d.
Mar. 26.	East Jane	11½	15 13 6	—	331 14 10½
	North Devon	13	11 2 6	—	
	28. East Logylas	21	13 0 0	Sims, Williams & Co.	273 0 0
	Cwmystwith	40	14 8 0	Newton, Keates & Co.	576 0 0
	"	50	14 2 0	Sims, Williams & Co.	1,410 0 0
	"	50	11 2 0	Walker, Parker & Co.	
	Cwmbrane	16½	13 18 0	Sims, Williams & Co.	229 7 0
	29. Maesyskafn	140	14 16 6	Walker, Parker & Co.	2,075 10 0
	Twelve Apostles (blue ore)	80	14 5 0	A. Eytton	1,246 17 6
	(white lead)	15	7 2 6	ditto	
	30. Minera " Union	11	14 5 6	ditto	157 0 6
	31. Gt Northern Co. of Ireland	20	13 18 6	Walker, Parker & Co.	557 0 0
	"	20	13 18 6	A. Eytton	
	Bwlchyrplwm	26	14 2 0	Newton, Keates & Co.	—
	Brondloyd	50	15 1 6	A. Eytton	753 15 0
	Wheal Ludecott	47	17 15 6	Trefry's Trustees	835 8 6
April 1.	Minera	100	14 18 0	ditto	9,604 1 0
	"	100	14 17 6	Walker, Parker & Co.	
	"	100	14 17 6	ditto	
	"	100	14 17 6	ditto	
	"	64	14 17 6	ditto	
	"	100	15 0 0	Panther Co.	
	"	74	14 17 6	Walker, Parker & Co.	3,238 0 0
	6. Isle of Man Mining Co. ...	8	12 7 0	Newton, Keates & Co.	
	"	70	16 10 6	Newton, Keates & Co.	1,712 5 0
	Wheal Mary Ann	90	23 2 6	J. & J. Williams	
	"	45	28 3 0	R. Mitchell & Son	2,183 7 6
	"	30	14 17 0	ditto	
	Wheal Trelawny	55	28 15 6	Trefry's Trustees	2,260 0 0
	"	54	11 2 6	ditto	
	11. Frongoch	160	14 2 6	Walker, Parker & Co.	289 5 6
	Cefn Brwynn	10½	13 15 6	ditto	
	"	10½	13 15 6	Panther Co.	1,301 5 0
	East Darren	75	17 7 0	Newton, Keates & Co.	
	Gochman	21	19 16 6	Sims, Williams, & Co.	619 1 0
	"	10	19 6 0	A. Eytton	
	Cwm Erfin	30	17 8 6	Walker, Parker & Co.	1,146 12 6
	"	35	17 16 6	ditto	
	13. Great Lavey	100	24 14 0	Sims, Williams, & Co.	2,470 0 0
	14. Talargoch (Maesyrerwiddu)	43	15 11 0	Walker, Parker & Co.	1,694 3 0
	(Coetia Llys)	76	16 2 6	A. Eytton	
	Deep Level	13	14 5 0	ditto	185 5 0
	Brynford Hall	12	15 1 0	ditto	180 12 0
	South Kilmory	6	14 5 6	Walker, Parker & Co.	85 13 0
	Parry's	28	14 18 6	ditto	417 13 0
	Bryn Gwiog	40	15 4 0	ditto	604 0 0
	Long Rake	20	14 14 0	A. Eytton	294 0 0
	Speedwell	8	13 12 6	Brymbo Co.	109 0 0
	Merilyn	5	13 8 6	Walker, Parker & Co.	67 2 6
	Garreg	3	15 0 0	ditto	45 0 0
	North Henblas	25	13 11 0	Newton, Keates & Co.	338 15 0
	Pennant	15	14 8 6	Walker, Parker & Co.	216 7 6
	Chware Las	2	15 0 0	ditto	30 0 0
	Dog Pit	11	13 8 6	Newton, Keates & Co.	147 13 6
	Pwllgwen Idnur	26	14 14 6	ditto	382 17 0
	Llangynog United	27	14 10 0	Walker, Parker & Co.	391 10 0
	Dyfnwim	15	14 12 6	ditto	219 7 6
	Roman Gravels	25	14 13 6	ditto	366 17 6
	Dyliffe	8½	14 12 6	ditto	124 6 3
	Caecconroy	13½	15 12 6	ditto	210 18 9
	18. Harwood	10	14 2 6	Locke, Blackett, & Co.	141 5 0
	19. Minera Boundary	30	13 17 6	A. Eytton	416 5 0
	Dyliffe	76	14 17 6	Walker, Parker & Co.	1,785 0 0
	"	44	14 17 0	ditto	
	Coolartra	10	14 0 0	—	140 0 0

THE

MINING AND SMELTING MAGAZINE.

JUNE, 1864.

Cardiganshire Buddle.

BY JOHN DARLINGTON.

ABOUT the end of the year 1855 the Agents of the Lisburne Mines designed and arranged a reciprocating buddle, having for its object the mechanical separation of non-metalliferous portions of the vein stuff, from the ore with which it is generally associated. For this purpose an inclined table was constructed, and a series of rakes so contrived as to propel the stuff against a thin sheet of water, at the same time, these rakes, being set at an angle somewhat oblique to the line of motion, traversed the heavier or ore portions across the table, whilst minerals of lesser density were swept away by the mere force of the stream. The apparatus proved to be highly advantageous for separating blende from lead ores, and seldom failed to give good results whenever sensible differences existed in the density of the minerals operated upon. The cost of this machine, together with a small water wheel, balance lever, &c., was about 30%.

The sketches Figs. 21, 22, and 23, represent plan, side, and front elevation of a rotary separator constructed by Captain James Sanders, and now in operation at the Cardigan Consols. The apparatus consists of—

- (a.) Water Wheel.
- (b.) Driving Cones.
- (c.) Separating Sieve.
- (d.) Trommel.
- (e.) Table.
- (f.) Bin for collecting "Rich work."
- (g.) Strake for collecting "Tailings."

(a.) The water wheel is constructed of wood with sheet iron buckets. A wheel six feet in diameter and eight inches in breast will be found to give ample power for driving the trommel.

FIG 21.

PLAN OF SEPARATOR.

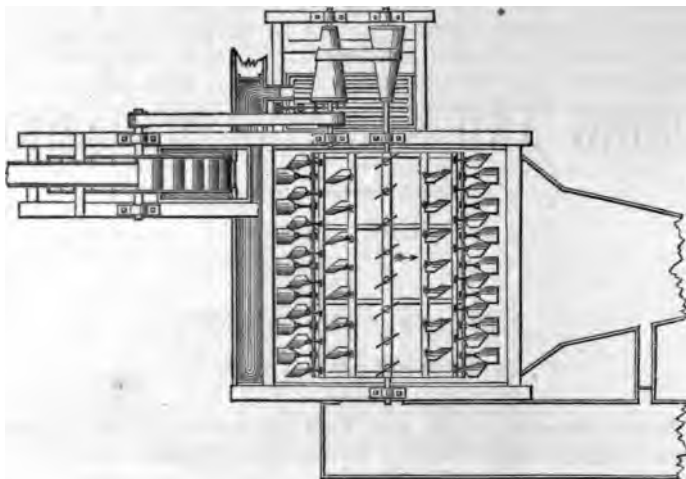
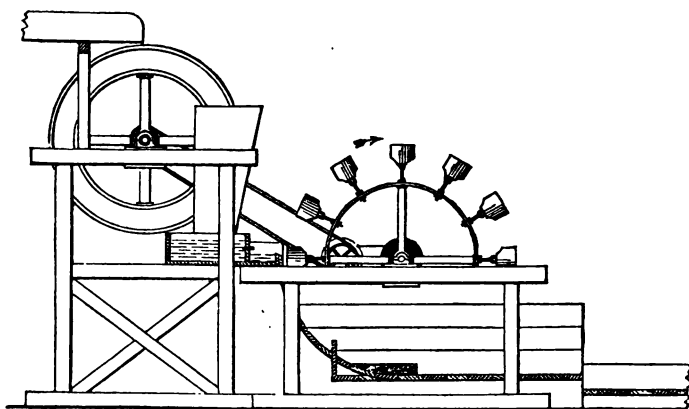


FIG. 22.

SIDE ELEVATION OF SEPARATOR.

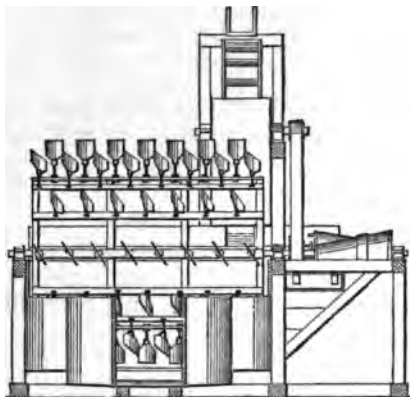


(b.) In order that the speed of the trommel may be carefully adjusted to the nature of the stuff to be treated, driving cones are employed to communicate the necessary motion. The larger diameter of these wooden cones may be fifteen inches, diminishing to five inches at the smaller ends.

(c.) Straw, heath, and extraneous substances are prevented from entering the separating table by the introduction of a flat sieve. In addition, this sieve serves to retain the sand which is sufficiently coarse to resist successful treatment. The sieve has a percussion motion given to it by means of studs inserted in a disc wheel fixed on the axis of one of the cones.

FIG. 23.

FRONT ELEVATION OF SEPARATOR.



(d.) The trommel is formed of three iron hoops which are braced together by means of flat lateral bars 6 feet in length.

Into these bars are inserted the scrapers which are pitched in the form of a screw.

The hoops are 4 feet diameter, made of bar iron $1\frac{1}{4}$ inch \times $\frac{3}{8}$ inch, the scrapers are made of light sheet iron, and are 9 inches wide by 6 inches deep, the shanks or stems are 6 inches long, hence the outside diameter of the trommel is 6 feet. There are twelve rows of scrapers mounted on the periphery of the trommel. The first, fifth, and ninth rows contain nine, the remaining rows are fitted with eight scrapers. Each scraper is adjusted by slightly rotating the stem and then tightening the screw-nuts.

(e.) The motion of the trommel is against the flow of water. From its vertical to within a short distance of its horizontal axis, the separating table is concentric with the circumference of the trommel scrapers; but from the vertical axis the table is prolonged at an angle more or less inclined according to the density of the stuff which it is designed to separate. The table is constructed of plank $1\frac{1}{4}$ inch thick, and is covered with thin sheet iron.

(f.) The bin is about 2 feet 6 inches wide, by 8 feet in length,

and may be arranged for transferring the rich work either to jiggings, round buddles, or other suitable dressing appliances.

(g.) The stuff collected by the strake, may be subjected to additional mechanical treatment, or, if sufficiently poor, taken to the refuse-heaps.

The ore and vein stuff enter on one side of the table, and are dashed against the stream by the action of the scrapers. The denser portion is progressed across the table into the ore bin, through an opening 18 inches long and 3 inches deep, the lighter minerals are drifted into the strake. In this way a separation is effected. Care must however be taken to distribute the stream of water equally upon the surface of the table, and to proportion its volume so as to divide the inferior from the more valuable minerals. The water flowing from the wheel serves not only to supply the table but a part of it is also diverted into the feed-hopper, any excess being discharged through a waste sluice.

The quantity of stuff which can be passed through the apparatus in ten hours, will vary with the character and constituents of the minerals to be dealt with.

Captain Sanders estimates the weight at from 15 to 20 tons, and the cost of the machine, exclusive of the water wheel, at about 9*l*.

The Origin of Crystalline and Eruptive Rocks.

No subject has been more keenly controverted, or passed through more phases of opinion, than the theory of the origin of crystalline rocks. By the followers of the Huttonian and Wernerian Schools it was disputed with as much virulence, and as little regard to fairness, as if it had been a theological dogma; and even of recent years—although most people seemed to have imagined all controversy on the subject at an end—an able school of German chemists and physicists, and the great majority of practical miners throughout the world, have never ceased to protest against the *à priori* ultra-igneous hypotheses of the generation of geologists now passing away. As far as miners are concerned—while their rejection of these hypotheses does credit to their instinctive judgment—it must be confessed that they did no more than protest; and that, from not understanding the real points at issue, their protests were rather injurious than otherwise. The preliminaries of the real work, which gradually modified the opinion of all who have seriously studied the subject, was done by the Germans. They made the beginning of the work, and deserve all credit for it; although recently they have been superseded by English and French enquirers, better known to us, who have brought to light facts that have given us an entirely new insight into the conditions under which crystalline and eruptive rocks have originated. As the economic importance of the subject

is obvious, we need make no apologies for referring to it in this *Magazine*; indeed it is now pretty evident that the genesis of metalliferous veins is somehow or other intimately connected with the same conditions as those under which great masses of deep-lying sedimentary rocks were—as we shall show—so metamorphosed as to become ultimately eruptive.

As the rejection of the ultra-igneous hypotheses seems taken, by some persons, as a return to the Wernerian theories, it may be well to point out at once that this is a mistake. Werner assumed that granite, with the trappean and basaltic rocks, had been deposited from water, and, in origin, consequently differed only from the recent sedimentary rocks in being precipitated from a primitive or chaotic ocean; while the essential doctrine of Hutton—and he seems to have been the first who clearly conceived it—was that these rocks had originated *from beneath*. Now it cannot be too clearly understood that the former hypothesis has been completely disproved, and the Huttonian doctrine—as to these rocks originating from beneath and being sometimes eruptive—incontrovertibly established. But it does not follow that by adopting this doctrine, and consequently admitting the plasticity of such of these rocks as have been erupted, we accept the popular modern igneous hypotheses, which assume them to be portions of a primitive molten interior, the residue of a formerly wholly fluid-incandescent globe. On the contrary, the philosophy of Hutton was the very opposite to the philosophy inculcated by these hypotheses; for he ever refused to admit that, in geology, man could find any traces of a beginning. Indeed they rather embody the philosophy of Werner, which was that we could trace a beginning—the *mode* of the beginning only being altered. In fact, the foundation upon which the ultra-igneous hypotheses were originally built up was the presumed fact—then generally believed to be unquestionable—that all granite was “primitive,” or in other words had originated, or assumed its present form, prior to the deposition of any sedimentary formation upon it. As long as this belief was accepted as a fact, the Wernerian philosophy, that we could trace a beginning, had certainly a most plausible basis; but, the moment it was shown not to be a fact, that philosophy and its correlated ultra-igneous hypotheses, lost their only logical foundation. Years ago it was shown that granite broke through secondary deposits; more recently it has been shown to be of tertiary age; and so far from being essentially “primitive,” we know at present of no granite mass of which we cannot prove an origin subsequent to some sedimentary deposits. With these facts, the Wernerian philosophy of a traceable beginning was incompatible, although the incompatibility was long in being recognised.

But leaving aside considerations as to the philosophy of geology, it may be admitted that all the early enquirers were equally mistaken as to their facts. The true theory, that of the metamorphic origin of crystalline rocks, is of recent date; and its full extent and importance is generally so little understood or recognised, even at the present moment, that our object in these few pages is to show the great extension given it by the most recent enquiries.

Among those who have laboured in the cause of metamorphism

none have done better service than Mr. Sterry Hunt. Indeed, while numerous chemists and physicists have been working on the subject, he is almost alone among field-geologists in having given it a zealous or serious attention. In his last contribution on the subject to the *American Journal of Science and Arts*, the conclusions he states are so decided that we think they will interest our readers to give an abstract of them.

He starts with the enunciation of the opinion that the various eruptive rocks have no other origin than the softening and displacement of sedimentary deposits. The merit of originally adopting this view he attributes to Christian Keferstein, who, in his *Naturgeschichte des Erdkörpers*, published in 1834, maintained that all the unstratified rocks, from granite to lava, are products of the transformation of sedimentary strata, in part very recent; and that there is no well-defined line to be drawn between Neptunian and volcanic rocks, since they pass into each other.

Next, citing Sir John Herschel, Mr. Poulett Scrope, and Mr. Sorby's admirable investigations on the microscopic structure of crystals, he goes on to show how the deeply buried sedimentary strata having, under the combined action of heat and water, been rendered sufficiently plastic, may either have lost in a greater or less degree the marks of their sedimentary origin without any change occurring in their original stratigraphical position, as in the case of crystalline schists; or have been further altered so as to be displaced by pressure and forced among the neighbouring strata, thus assuming the form of eruptive rocks—but which, being consolidated under pressure, retained the same mineral characteristics as the parent beds. It is only in the case of those rocks which, like lavas, were consolidated at or near the surface, and consequently under feeble pressure, that mineralogical characteristics dissimilar to those of the undisturbed metamorphosed crystalline sediments are observable.

Under this hypothesis, Mr. Hunt proposes to class crystalline rocks into two divisions:—

1. Indigenous rocks, or sediments altered *in situ*; and,
2. Exotic rocks, or altered sediments which have become displaced or translated, thus forming eruptive and intrusive masses.

Referring to opinions prevalent a few years back, which attributed an eruptive origin to many rocks now admitted to belong to the class above called indigenous, Mr. Hunt says it is impossible longer to question the sedimentary and indigenous character of many granites, syenites, and diorites. Among such he instances the melaphyres of the Tyrol, which are now admitted to be sediments of Carboniferous age, metamorphosed *in situ*; the granites of the summit of the Alps, which now appear to be tertiary strata altered in place; the granites of the White Mountains of New Hampshire, which Mr. Lesley's recent investigations have proved to be clearly stratified metamorphosed sedimentary deposits in nearly horizontal layers; and the amphibolites of the Pyrenees which, according to a recent note of Virlet, are not eruptive, but merely altered indigenous rocks,

belonging to the Triassic series. But, although essentially indigenous, many of these rocks appear, while having been in a soft semi-fluid condition, to have undergone movements which at places show a passage into eruptive rocks. Hence, while the tendency of recent observations is to favour the theory of the indigenous nature of many rocks hitherto regarded as eruptive, there is at the same time evidence that such rocks were occasionally displaced—that is to say, that a rock essentially indigenous may at times assume an exotic or intrusive form, and that consequently the distinction between the two classes of crystalline rocks is a *geological*, and not a *lithological* one.

As to the conditions under which these great metamorphic actions have taken place, Mr. Hunt does not say much, and they must obviously indeed for many years remain in the region of speculation. Whether they are in a great degree due to causes which acted with greater intensity in the earlier periods of the world's history, or can be accounted for by the causes now in action, is a point which may be expected to be contested with great tenacity. For our own part we entirely repudiate the theory of the greater intensity of early geological causation, that is to say, as far back as we can trace; and, consequently, we believe that even the most gigantic operations of metamorphism can be accounted for by causes now in action under the earth's crust, in which water acts a principal part. We may, on a future occasion, refer to this most important subject.

Before concluding this note, however, we may refer to one subject which seems to have escaped the attention of Mr. Hunt, and that is the bearing of the remarkable facts set forth by Mr. Sorby in his Bakerian lecture "On the Direct Correlation of Mechanical and Chemical Forces," on the origin of eruptive rocks. Many persons who may be prepared to admit the probability of sedimentary strata becoming sufficiently plastic as to allow of the obliteration of their original stratified character—who may be prepared in fact to admit the metamorphic origin of indigenous rocks—may still deny the possibility of such an origin for eruptive rocks. They will ask—whence was derived the enormous power required to thrust these rocks in the manner we often find them among neighbouring stratified deposits? Four or five years ago M. Daubrée, in his *Etudes sur le Métamorphisme*, showed empirically that certain substances increased their bulk in the process of alteration by one-third of their original volume; and Mr. Sorby's memoir proves, what was never before suspected, that there is a *direct* correlation between chemical action and mechanical force, which would amply account for this increase of bulk, as well as (conversely) for increased chemical action at considerable depths under the earth's surface, which mechanical energy is absorbed, to be (conversely) given out when the chemical affinities become inverted. In a former number (see *Mining and Smelting Magazine*, Vol. IV, No. 21, Sept., 1863, p. 159) we gave an abstract of Mr. Sorby's paper, to which we refer any of our readers interested in the subject. We may simply state here that Mr. Sorby concludes:—

- (a.) That pressure *weakens* chemical affinity if it acts *against* change of volume,
- (b.) That pressure *strengthens* chemical affinity if it acts *in favour* of change of volume,
- (c.) That chemical action is directly convertible into mechanical force and mechanical force into chemical action, in definite equivalents, according to well-defined general laws, without any intermediate action of heat or electricity.

Conclusions which we think will ultimately lead to the elucidation of the laws that have produced eruptive rocks.

The Mines and Mining Operations of Cornwall.

BY H. CURWEN SALMON, F.G.S.

(Continued from page 261.)

The two last-named districts skirt the borders of the Land's End granite range. The next two we come to—those of *Marazion* and *Breage and Sithney*—may be described as occupying the killas basins lying on the west and east of the small granite range of the Tregonning and Godolphin hills, between it and the two great granite tracts of Penwith and Carn Menelez.

3. *Marazion District*.—This district occupies the western of these killas basins, stretching along the coast of Mount's Bay for a length of upwards of 6 miles, from the foot of Tregonning hill to the granite of the Penwith range in Ludgvan parish. It extends inwards from the sea about 3 miles, and comprises the parishes of St. Hilary, Perranuthnoe, and parts of Breage, Germoe, and Ludgvan, and has yielded large quantities of both copper and tin—but principally the former, which seems to make in connection with elvans. On the whole it has been a highly productive, though not a very permanent or deep district as far as yet seen.

4. *Breage and Sithney District*.—This district occupies the eastern killas basin referred to, lying between the granite of the Tregonning and Godolphin Hills and that of the Wendron range. In length, however, it is very restricted, rather skirting the former in a north and south line, than extending any distance east from it. It includes the parishes of Breage, Germoe, and part of Sithney, and is almost exclusively a tin district, having made some of the richest and deepest deposits of that metal ever met with in Cornwall. Although I have described this as a killas district, which it mainly is, some portion of the small granite range has been found productive for tin—as for instance the old Great Work mine, lying in the granite trough between the Tregonning and Godolphin Hills.

5. The *Gwinear and Phillack District*, which we may take next,

is a very exceptional one, not being distinctly connected with any granite range, but occupying a rather undefined killas basin about 5 miles square, skirting the north coast between the granite of St. Ives and Lelant, and the granite of the Carn Brea and the north-west portion of the Carn Menezes ranges. It comprises the parishes of Gwinear with parts of Phillack, St. Erth, Crowan, and Gwithian. It is essentially a copper district, that metal making in connection with elvans, and although it has been fairly productive, yet, on the whole, it has been economically the worst district in West Cornwall from the extremely buncy and uncertain nature of its metallic deposits.

The three following districts—those of *Wendron*, *Camborne*, and *Redruth and Gwennap*—are connected with the great granite range of Carn Menezes and the two smaller granite hills of Carn Brea and Carn Marth associated with it. The first is in the Carn Menezes granite, but the other two skirt this range on the north with the two smaller granite hills named.

6. *Wendron District*.—This district is situated entirely in the granite, principally in Wendron parish, but also extending into Sithney, Crowan, and Constantine. It is exclusively a tin district, and a very ancient one, but it is has never been particularly rich, although it has been largely and constantly productive. It consists almost wholly of a wild moorland country, and does not possess any very striking mining features.

7. *Camborne District*.—This is at present the richest district in Cornwall, and—barring the precious metals—for extent and permanence one of the richest, if not the very richest in the world. It comprises the southern portions of the parishes of Camborne and Illogan, and has a length of about 4 miles from east to west, from Blowing House Bridge to Barreppa, with a width of less than 3 miles. It includes the whole of the narrow detached range of Carn Brea, which skirts the main Carn Menezes granite tract on the north; and it is along the junction of these granite ranges with the killas that the great metalliferous zones are met with. Possessing the deepest mines now working in the country—mines which have gone through numerous phases, having been formerly as productive for copper as they are now rich for tin—this district will necessarily be found one of the most important and interesting of those I shall have occasion to describe.

8. *Redruth and Gwennap District*.—This district immediately adjoins the Camborne district on the east, so that it is only possible to draw an arbitrary line between the two. Still in a mining and in a geognostic sense it is very distinct, for it may be defined as the zone of metalliferous country skirting and extending into the Carn Marth granite range, and (for a short distance) the main granite range of Carn Menezes. It includes the parishes of Redruth and Gwennap, and parts of Kenwyn, Kea, and St. Agnes, and has the general form of a circle about 5 miles in diameter. It is essentially a copper district, and has produced the richest mines for that metal ever known in Europe, although of recent years its productiveness has fallen off. The southern part of this district in Gwennap parish, may be considered to a great extent exhausted, but the northern portion, about

Blackwater and Chacewater, has recently commenced opening up again. In the extreme eastern portion of the district, the great mining region of West Cornwall may be considered to come to an end in the great mundic lodes of Kea parish, near Truro.

The two remaining districts of West Cornwall—those of *St. Agnes* and *Perranzabuloe and Newlyn*—lie to the north, and are much more indefinite and uncertain in character than any we have yet described, with the exception of Gwinear.

9. The *St. Agnes District* is a very ancient one, and formerly occupied a position of some importance. It embraces an area of indefinite extent along the north coast in the parish of *St. Agnes* and the western portion of *Perranzabuloe*. It has been largely productive for both tin and copper, which seem to make in connection with elvans.

10. *Perranzabuloe and Newlyn Lead District*.—This large scattered district includes the greater portion of *Perranzabuloe*, with parts of *Newlyn*, *St. Allen*, *St. Erme*, *Kenwyn*, *Cubert* and *Crantock*. It contains numerous lodes running in almost every direction, and has made one wonderfully rich lead mine, and a few moderately successful ones.

These districts include the whole of the metalliferous region of West Cornwall, with the exception of one or two outlying points—principally lead mines—such as the *Swanpool* lead lodes near *Falmouth*, *Wheal Rose* and *Wheal Penrose* lead lodes near *Porthleven*, and the curious veins of native copper found in the serpentine district of the *Lizard*.

The districts of *East Cornwall* and *South Devon* being more indefinite and scattered are much more difficult to define than those of the West; I, however, divide them into the ten following districts.

11. *St. Austell and Par District*.—This district skirts the southern limits of the *St. Austell* or *Hensbarrow* granite range for a length of fully 8 miles between it and the sea at *Tywardreath Bay*. It has been a very rich district for copper, but its mines are now comparatively poor for this metal; some of them yield, however, at present a considerable quantity of tin.

12. *St. Austell-Moor Tin District*.—Some of the lodes of the last-named district pass into the adjoining granite with little change of character, and these I should hold as belonging to that district; but the main body of the *St. Austell-moor* granite and the *killas* skirting it on the north is, with its containing tin lodes and branches, of so peculiar and exceptional a character, that I deem it absolutely essential to class it as a separate district. Viewed in this light, it is a very extensive and rather indefinite district, including all the stanniferous portions of the granite, and the *killas* country to the north of it, in the parishes of *Roche*, *St. Denis*, and parts of *Lanivet*, *Withiel*, *St. Wenn*, *St. Colomb*, and *St. Enoder*. In old times this district produced large quantities of tin, but in modern times this has fallen off very greatly. It is quite possible that it may again become largely productive for this metal, but if so, it must necessarily be under a system of working suitable to the peculiar nature of the district, and, consequently, different to anything at present practised in Cornwall.

13. *North Coast District*.—This extensive tract of country, which can scarcely properly be called a "district," extends along the north coast for nearly 25 miles from St. Columb to the east of Camelford. Throughout various portions of this large tract numerous very showy lodes are met with, showing lead and grey copper, and others producing argentiferous mundics and gozzans. In two or three places these lodes have made good bunches of ore, but, on the whole, this north coast country has been hitherto a complete failure.

14. *Caradon District*.—This is a granite district lying on the southern borders of the great granite range of Bodmin-moor, skirting the south-eastern and southern junction of that rock with the killas country of the parish of Linkinghorn, St. Cleer, and St. Neots. The lodes of course make in the killas as well as the granite; but, as the former rock in this district is what miners call "weak," it never has been, nor is it ever likely to be, productive of much copper. The ore makes in a granite zone skirting the junction, of greater or less width, but of course never extending very far into the hard granite. Taking this district in its widest sense, as extending from West Sharp Tor round to St. Neots, the zone would be about 10 miles long, some portions of which, as at Phoenix Mine and the Caradons, have been highly productive for copper. When the lodes get far into the granite, they seem to make tin.

15. *Callington District*.—This district may be described as clustering round the two smaller granite protrusions of Kit Hill and Gunnis Lake, which form, as it were, connecting links between the two great granite ranges of Bodmin-moor and Dartmoor. It would thus form an area, in the parishes of Stoke Climsland, Calstock, and Callington, upwards of 5 miles long by nearly 3 miles wide, throughout which numerous lodes have been worked, principally for copper. At present this district is economically unimportant, but, in its palmier days some of its mines were of note.

16. *Tavistock District*.—This district is a very extensive one, comprising the whole of the killas country extending from the Tamer to Dartmoor, with a width from north to south of fully 10 miles. It is closely connected with the Callington district—indeed the boundary between them is an arbitrary one, for Devon Consols (the richest mine in the Tavistock district) is geognostically connected with the Gunnis Lake granite. It is, as we shall see, a remarkable district in every respect, and worthy of careful study for many reasons.

17. *Bridestow and Oakhampton District*.—To the north of the Tavistock district, skirting the northern flank of Dartmoor, a great number of curious and highly distinctive lodes have been opened out on, and at one or two points slightly worked. Whether these will ever come to anything may be questioned, but if they do, as they have a *facies* of their own, they will be entitled to a separate classification—which, consequently, for convenience sake, I now give them.

18. *Ashburton District*.—Under this name, I include all the lode-bearing district skirting the eastern side of Dartmoor for some miles north and south of Ashburton. It produces numerous showy lodes, some of which have yielded no inconsiderable amount of

copper and tin; but it has hitherto failed to make a profitable mine.

19. *Dartmoor Tin District*.—A considerable proportion of the large granite tract of Dartmoor is found to contain numerous tin lodes, which, in former days, were worked very extensively, but which are now almost abandoned. For two or three reigns the dues derived from them were said to have been the principal source of revenue of the Earldom of Cornwall—the Earl Richard, in 1257, being said to have been enabled to purchase the title of King of the Romans, from the wealth derived from the revenue of these mines. The tin produce of Dartmoor at one time certainly exceeded that of all Cornwall. The circumstances of their abandonment will evidently form a curious, and, indeed, useful inquiry.

20. *Lead Districts of East Cornwall and South Devon*.—From the river Fowey to the river Teign, a distance of nearly 60 miles, the Tavistock and Ashburton districts are skirted on the south by a wide tract of killas country, which has been found to contain productive lead lodes at irregular intervals. All these lodes are approximately north and south, differing in this respect from the Perranzabuloe and Newlyn district, which also contains east and west lead lodes. Although extending over such a great area, I have seen no good reason to divide this lead tract into separate districts, for, as far as I have observed, the geognostic conditions under which the lodes bear lead are the same throughout. The principal mines in this tract are Herodsfoot, Mary Ann, Trelawny, and Ludcott, in the neighbourhood of Liskeard; the Tamer mines, on the river Tamer; and the Exmouth and Frank Mills mines, on the banks of the river Teign, within ten miles of Exeter.

(To be continued.)

Abstracts and Reviews.

ELECTRIC LAMP FOR LIGHTING AND BLASTING IN MINES.

The electric lamp of MM. Dumas and Benoît—the former engineer at the Iron Mines du Lac, near Privas (Ardèche), and the latter a Doctor of Medicine—having been submitted to the Academy of Sciences, and afterwards subjected to a series of practical trials by MM. Dumas and Parran, at the collieries of Bessèges, Lalle, Rochebelle, and Grand-Combe, has been described by the latter engineer in the last number of the *Annales des Mines*.

LIGHTING MINES.—Although the present system of safety lamps is practically sufficient, both in respect of efficiency and safety, for all ordinary cases, there are yet circumstances under which they become absolutely useless; for instance, in searching inaccessible places or in sumps—which are rare instances; or where it is required to penetrate workings, the air of which, although capable of being respired, cannot support combustion. It is evident, therefore, that a system of lighting which would meet these difficulties would be a desideratum.

The idea of applying electricity to the lighting of mines naturally

followed on the discovery of the magnificent light afforded by the incandescence of carbon connected with the poles of a voltaic current. It seems first to have occurred to M. Louyet and M. Boussaingault, the latter of whom proposed connecting the light and the pile by long conductors; but M. de la Rive, in his *Traité de l'Electricité*, appears to have been the first to propose a portable pile. Both notions, however, were barred by insuperable practical difficulties, and the subject remained in abeyance until recently taken up by MM. Dumas and Benoit, who brought to bear on it later electrical discoveries. The phenomenon of induction discovered by Faraday, the energy and regularity obtained by a Rhumkorff apparatus, and the surprising effects of stratified light and of fluorescence which they produce under certain conditions, were the basis upon which these gentlemen set about resolving the problem.

1. *The Pile*.—The pile is composed of a cylindrical zinc vessel, having on the outside an isolating covering of caoutchouc, a porous vessel, and a hollow cylinder of carbon. The zinc cylinder is about 8" high and 4" in diameter, in which the liquids occupy 6". The pile is supplied with diluted sulphuric acid, some bi-chromate of potash being thrown into the porous vessel. If the zinc is well amalgamated and the acid supplied in proper proportions, the battery will continue in operation about twelve hours. The carbon is the positive pole and the zinc the negative.

2. *Rhumkorff's Coil*, having been described in numerous treatises on electricity, requires no special explanation here; with it is connected his condenser, and these together produce the phenomena of the electric lamp.

3. *Giessler's Tubes*, thus named from their inventor, a clever instrument maker at Bonn, are of very variable form, containing expanded gas through which an electric current may be passed. They are of glass or crystal, their extremities, which are hermetically closed, being traversed by two platinum wires.

If a small quantity of any vapour or any gas, suitable for showing the stratification of the electric light, is enclosed in one of these tubes, and if the ends of the platinum wires are connected with the two extremities of Rhumkorff's apparatus, we perceive throughout the whole length of the tube a series of luminous sheets, separated from each other by dark intervals. A tolerably large dark interval generally separates the negative pole from the first luminous sheet; but immediately in contact with the negative pole itself there is seen a luminous atmosphere divided into extremely thin bands. The colour, lustre, spectrum, in a word, the various characteristics of this light, depend on the gaseous substance contained in the tube, on the nature and form of this tube, and, according to the recent experiments of MM. Plucker and Hittorf, on the power of the inductive apparatus, and on the temperature developed by the passage of the current. The electric light produced in these tubes is also influenced, as has likewise been shown by MM. Plucker and Riess, by the approach of magnets and even of simple conducting bodies. It may also acquire a more brilliant and more equal lustre by utilising the fluorescence of the glass.

As this phenomenon of fluorescence (or persistent luminosity of bodies under the influence of electricity) plays an active part in the action of the electric lamp, it may be well to say a few words upon it. M. E. Becquerel has shown that by introducing certain phosphorescent substances in powder or in small pieces—such as the alkaline earthy sulphides or fluorides—into closed tubes, the air in which has been rarified to a pressure of one or two millimetres, and then passing through this tube electrical discharges from the Rhumkorff coil, a continuous light may be obtained, the intensity and colour of which depend on the energy of the current and the nature of the substances enclosed in the tube. This light does not produce any appreciable heating. He also subsequently announced that M. Rhumkorff had observed in certain of Giessler's tubes,

which only produced varied gas, persistent luminous traces, lasting several seconds after the passage of the discharges, and analogous to those observed in the tubes containing phosphorescent matters. The fluorescence of glass under the influence of the electric light is clearly shown, according to M. Giessler, when an inducing current is passed through a Giessler tube, half of which is of English glass with a lead base, and half of German glass with a potash base. The first half shows a green fluorescence and the second a blue fluorescence.

The luminous effects obtained in Giessler's tubes, by the induced current from the Bunsen cell, have been recently applied to several scientific purposes, particularly to the spectral analysis of gases and vapours by M. R. Harker and Harnard. But the idea of utilising this in a portable apparatus for the lighting of mines—and the practical carrying out of this idea in the face of many difficulties—is entirely due to M. Moine and Berthel.

As the coil and the pile must necessarily be limited both as to bulk and weight when intended to be applied to a portable apparatus, it becomes in this case of the highest importance to consider in detail any variations—such as the nature and the pressure of the gases enclosed in the tube, and the form and chemical composition of the latter—which may produce the greatest useful effect in intensity, regularity, and duration. The arrangements described below are those which up to the present time have given the best results, with the small coil and an electric pile such as we have mentioned.

The tubes contain, enclosed under a pressure of from 2 to 15 centimetres of mercury, metallic vapours (mercury, per-chloride of zinc, &c.) and certain gases, such as nitrogen, carbonic acid, hydrogen, &c.; the employment of any of which under the action of the current would give rise to a deposit being avoided. The experiments made in the mines of Alais were with tube No. 1, Fig. 24. In this tube and in those shown in Figs. 25 and 26, the coiled or extended portions of the tubes have an exterior diameter of from 2 to 3 millimetres, and an interior diameter of about 1 millimetre. But there are still probably many improvements to be made in the form of the tube.



4. *Arrangement of the Electric Lamp.*—The pile and the coil (both entirely isolated) are arranged in the two compartments of a case of leather or hard caoutchouc, which is carried slung to the body by a strong strap. It is provided with a wooden cover with caoutchouc joints, which are perfectly impermeable. The Giessler tube is enclosed in a cylindrical glass case, protected by two supports of copper braced together by four rods and covered with caoutchouc—thus recalling the appearance of an ordinary safety lamp.

The communication with the induced coil is established by two isolated wires of sufficient extent. The tube may be hooked on in front of the case containing the battery, so as to leave the hands of the miner free; it may also be carried in the hand or placed in any position within the length of the isolated wire. The total weight of the apparatus is about 5½ kil. (about 12 lbs.); and, though composed of many pieces essentially delicate, the apparatus once charged and closed cannot be tampered with, and may be confided to any kind of workman. The connection between the pile and the coil can be regulated by a button on the outside of the sling case; and the gases given off from the battery are removed by a very simple arrangement.

5. *Advantages of the Apparatus.*—The trial of this apparatus in the Alais collieries has given the following results:

The joints were shown to be as impermeable as possible, and no acid emanation was perceptible ;

When the current was turned on, the tube showed a vivid fluorescence which acquired a great intensity in the capillary tube ; when the current was broken the light disappeared, both effects being obtained by merely turning the button on the outside of the case.

The tube was not sensibly heated, and the light has no connection with the exterior atmosphere whatever it may be, since the effect produced is due to the rarification of the tubes, and would cease if they had any connection with the exterior.

The intensity of the light, which at first is slightly inferior to that of the ordinary safety lamp, becomes superior to it after a few hours burning, and surpasses it at all times in ill-ventilated workings. The light will no doubt be increased as the apparatus is improved, but at present it is sufficient for a miner to work by, to read the dial, to make notes and, in a word, for all general purposes.

The light afforded by the tube used in these experiments produced a light very similar, except of course in intensity, to that of a glow-worm on a summer's night ; it had a bluish colour, and a remarkable softness and purity. It will be necessary to ascertain by experiment if it affects the dial, and if so, in what manner.

The apparatus is at once strong and portable. The hands are free, so there is no difficulty in climbing ladders, or getting through difficult places. During a turn of three hours in very various portions of the Grand-Combe Mines, the lamp preserved its brilliancy unimpaired, and gave no difficulty in carrying. The sling-case may, if desired, be laid on the ground, and the lighting tube carried where required, if the conducting wires are made sufficiently long. The battery only requires attending to every twelve hours, and the value of the materials it consumes does not exceed 2½d. so that in these respects its conditions are similar to those of the ordinary safety lamp.

It is almost superfluous to add, that the electric lamp preserves the brilliancy of its light in any medium whatever, even under water. There is no possible danger of explosion even if the tube were to break in the midst of an explosive atmosphere, the distance of the electro being at least 6 centimetres apart.

It seems, therefore, to M. Parran in every way suitable for the purposes proposed by the inventors in those exceptional cases arising in the working of mines where the ordinary lamps become perfectly useless—for example, where it is required to push on rapidly to rescue persons in danger, to push on indispensable workings incapable of thorough ventilation, but in which the air, although fit to be respired, is incapable of supporting combustion.

One of the greatest difficulties met with at the Lalle mine, in endeavours to rescue some workmen, was to sink the inclined pits through the coal. Notwithstanding the use of ventilators, the lamps continually went out, and seriously injured the air ; so that it required a chain of men to be continually occupied in relighting them. If men had not been procured in sufficient numbers from the neighbouring mines to accomplish this, the rescue of the men might have been gravely delayed. The employment of an electric lamp would have avoided all this difficulty. When the opening was at last made, it required more than two hours to rescue

FIG. 25.

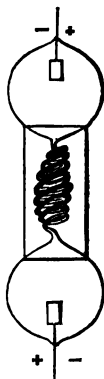
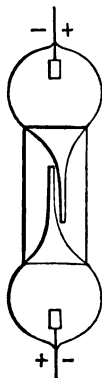


FIG. 26.



the last of the three men, who had been shut up for fourteen days, in consequence of its being necessary to ventilate the heading by air pipes before the lamps would burn in it. With the electric lamp, the man would have been saved in ten minutes.

The miners who assisted in the trials made by MM. Dumas and Parran in the Alais collieries all perfectly understood and appreciated the practical advantages of the apparatus. The only objection they made—and it was a sensible objection—was that it gave no warning to the miner of the danger he incurred on entering an atmosphere charged with carbonic acid or choke damp. It would be necessary, indeed, to find some other mode of ascertaining this point, of which experienced persons now judge by the character of the flame of the ordinary lamp, with the action of the gas on the eyes, the palate, and the sense of smell. This could be effected by the eudiometric analyses recommended by M. Thénard, and which could be readily effected by the apparatus itself. It would be also, of course, necessary under certain circumstances to adopt the use of respirators.

APPLICATION OF THE ELECTRIC LAMP TO BLASTING.—The advantage of applying electricity under certain circumstances to blasting in mines is incontestable. It is already used in sinking shafts in certain mines of L'Ardèche and du Gard, and is no doubt destined to be largely used in all works, when the simple apparatus required, which are now so strange to the public, become more generally known.

As far as we know, the first practical application of blasting by electricity in mines was made in 1851 in the iron mines du Lac, near Privas, Ardèche, by MM. Dumas (one of the inventors of this lamp) and Castel, mining engineer (*Annales des Mines*, 5th series, vol. 2, p. 199).

The powder was ignited by the incandescence of a very fine iron wire connecting the two poles of a direct voltaic current. The following were the conditions and results obtained:—

From six to ten of Bunsen's ordinary elements were required to ignite a single hole;

The earth was unavailable in the circuit, so two conductors were necessary to connect the pole to the battery with the ignitor; blasting under these conditions in a very hard shaft, with a great flow of water, was found to be very effective as to the regularity of the work, and particularly in securing the safety of the workmen. Nothing, in fact, is more dangerous in the hazardous occupation of a miner than setting fire to a hole in the bottom of a shaft. The smallest accident, the least delay in winding up the bucket, may be fatal. Recently, in sinking a shaft in the neighbourhood of Alais, a workman, who was being drawn up in the bucket, after having lighted the match, somehow fell back into the shaft; fortunately he received no serious harm, but probably would have been blown to pieces, but for the devotion of his comrade, who jumped to his side, and had the courage and good fortune to extinguish the match in time. Blasting by the electric lamp would put an end to all these dangers, because the current which would fire the hole would then be sent by the workman himself after he had reached a place of safety.

Still the process, such as we have described as being successfully employed by MM. Dumas and Castel, would scarcely be found generally applicable; and would probably have but seldom passed beyond the domain of theory, if the effects obtained by the induction apparatus had not enabled the operation to be greatly simplified.

Ten years ago M. Rhumkorff succeeded, by using Stateham's fuses, in igniting powder without fail by the induction spark produced by a single element on a very small coil. These fuses were simply composed of two conductors of copper or galvanised iron wire, the free ends of which were attached to the wires of the induced current—the other ends being placed in the manner shown in Fig. 27, at a distance of from two to three

millimetres apart, in the small indented guttapercha tube, or cylinder *m n*. The interior of this cylinder is sprinkled with a thin layer of sulphide of copper, which plays the part of a secondary conductor between the two wires, giving rise to a sufficient spark to ignite a pinch of fulminating mercury laid on the indentation of the tube—the whole being placed in a little caoutchouc-bag filled with fine sporting powder: the latter being likewise ignited, explodes the hole in which the bag is placed.

FIG. 27.

When the earth is made to form part of the circuit, only one of the wires of the fuse requires to be isolated, which is effected by a sheath of guttapercha, as shown in the figure. It was with this kind of fuse and the Rhumkoff apparatus that M. du Moncel fired, in 1854, the monster mines of the port of Cherbourg. This mode of blasting was also successfully applied eight years ago by M. Housseurt, mining engineer, in sinking a shaft at Saint-Etienne; and more recently it has been regularly applied in practice by M. Dumas in the iron mines of Lac, near Privas, and by M. Jouguet in the iron mines of Bessèges.

Experience has shown the conditions most favourable for carrying out this blasting with regularity and facility. In the first place, it is very advantageous to do away with one of the conductors by making the earth enter into the circuit, by which a crowding of the shaft as well as the difficulty of isolating one of the wires is avoided. One or two of Bunsen's ordinary elements suffice to fire four blasts at a time.

Stateham's fuses, with an isolated conductor arranged as shown in the figure, have about the same form as Bickford's safety fuse. They cost about 5*d*.; but when made on a large scale would no doubt be sold at a much lower price. They can easily be prepared on the mine, by simply procuring wire covered with guttapercha.

The cost of the material and necessary apparatus for electric blasting in a shaft 200 metres (110 fms.) deep, would be about 36*l*., but it would be premature to calculate the comparative cost per blast under the old and new systems; the difference, however, would probably be only trifling when the workmen become accustomed to the new system. But supposing the latter to be the dearer, the excess of cost would be amply compensated for by the regularity of the work and the considerable diminution in the number of holes lost, particularly such as have to be blasted under water. Another advantage, which under certain circumstances is undoubtedly of great importance, is that by the electric system several holes can be fired simultaneously. But the greatest and most decisive advantage of blasting by electricity is the absolute safety which it secures to the miner.

The lamp of MM. Dumas and Benoît affords new and very important facilities for blasting by electricity, for with the very portable apparatus we have described, M. Dumas has proved that he can fire four holes simultaneously; so that instead of the fixed machines hitherto employed, with their rather costly conductors, we have now an apparatus so portable that it can readily be carried into any portion of the workings of a mine, so that it merely suffices to have a conductor sufficiently long to enable the lamp to be placed out of the danger of the blast, which is ignited by putting one end of the induced current in communication with the conductor, and the other with the earth, by which the fluorescence of the tubes is only interrupted for a few seconds.



IMPROVED COKE OVENS FOR UTILISING THE PRODUCTS OF THE DISTILLATION OF THE COAL.

At the meeting of the members of the Institution of Civil Engineers on May 10th, a paper was read by M. Pernolet, of Paris, "On the Means of Utilising the Products of the Distillation of Coal, so as to reduce the price of Coke : with descriptions of the Ovens, and of the best Processes in use in Great Britain and on the Continent in the Manufacture of Coke." M. Pernolet believed that this question had been practically solved by the employment of existing ovens, to which certain inexpensive additions were made, and which, while still giving to the coke all the solidity, density, and lustre that distinguished good coke made in the ordinary way, enabled every product of the distillation of coal to be turned to account. This was effected, mainly, by keeping the coal from all contact with the air during its distillation, by performing that process very slowly, and by collecting and making use of the volatile products. The whole arrangement had been sanctioned by many years' experience, both in Belgium and France, where it was actively and profitably pursued at ten different establishments, with more than 400 ovens of the largest dimensions, capable of receiving from five to seven tons of coal at each charge.

In converting an old oven into one of the improved form, the floor was taken up and raised about 1 ft., so as to allow of its being heated from below by means of a fire-grate and flues. A new opening was made in the roof, in which was fixed a pipe, intended to receive the volatile products, and to conduct them to their destination. The ordinary door and the other opening at the top were so arranged that they could be kept hermetically closed. A chimney was also added to the masonry of the old ovens, and this was an essential part of the system, as it secured the circulation of the products of distillation. It had been ascertained that this chimney should be 50 ft. high, and not less than $3\frac{1}{2}$ ft. square, inside dimensions, for a group of sixteen contiguous ovens ; and that the sectional area of the main flue, connecting the different ovens with the chimney, should be three-fourths that of the chimney. In order to try whether the distillation was finished in any one oven, a valve was closed in the outlet-pipe ; when if the charring was incomplete, the gas still given off would cause cracks in the loam, with which the joints of the door were closely luted, and thus the necessity for continuing the process was demonstrated. The valve was then simply re-opened, so as to allow the gas again to pass off by the pipe. If, on the other hand, when the valve was closed no gas escaped at the joints, the charring was known to be finished, and the coke was fit to be drawn. During this operation the valve was closed to prevent the mixture of the external air with the gases circulating in the outlet-pipe, and the cast-iron cover of the opening at the top was kept shut, to avoid the risk of igniting the coke by the draught of air which would be created if it were open. The oven was arranged for charging from the top by means of wagons running upon rails, and in this way five tons of coal could be introduced in fifteen or twenty minutes, a rapidity which was most desirable for preserving the heat of the oven. When the charge was being withdrawn and replaced, the gas from the other ovens was allowed to pass continually in the fire-place, so that the floor was kept hot, and the gas accordingly began to show itself above the opening at the top, only a few minutes after the closing of the door. This opening was then hermetically sealed, and the valve in the outlet-pipe being raised, the communication was re-established between the interior of the oven and the great common flue. The products of the distillation were drawn off by the draught of the chimney, together with the condensation of the liquid, and the cooling of the gaseous products. After circulating in the great general flue, the products penetrated into the condensing apparatus, where they deposited

most of the tar and ammoniacal liquor, and returned to the ovens by the small general flue, whence the gas, purified and dried, passed to each fire.

The time occupied in charring varied with the nature of the coal, and the density desired for the coke, and with the arrangement of the oven. At St. Etienne it took upwards of seventy-two hours, with rich coal, while at Torton the time occupied was only twenty-four hours, with the rather poor but flaring coals of Commentry. As to the cost, it was stated that the expense of altering each oven at St. Etienne was about 20%, and that as the value of the additional yield from each oven ought to be about 60% per annum, this outlay should be repaid by four months' work.

It was asserted that the supplementary products due to these arrangements were—a larger yield of coke, and all the tar, the ammoniacal liquors, and the gas, which would be obtained from the same coals if distilled in the retorts of a gas manufactory. Thus, in the great coke-works at St. Etienne, the yield had been advanced from 58·8 to 69·3%, and in the Foundries et Forges d'Alais from 54·6 to 69·5%. Generally speaking, with rich or partially rich coals, the increase in the yield of coke was from 10 to 15%. As to the tar, the proportion collected depended on the nature of the coal, and the care taken both in the distillation of the coal and the condensation of its volatile products. It has averaged 2·53% at the Forges d'Alais, 3% at Elonges, 3·25% at St. Etienne, and had reached as high as 5% from the ovens of the Paris Gaslight Company, where only very bituminous coals were employed; but it was thought that there might be reckoned 3% of tar from the bulk of the coal distilled. The proportion of ammoniacal liquors depended also on the quantity of moisture contained in the coal, but it might be stated at a weight of not less than 10 lbs. of sulphate of ammonia, and sometimes it was as much as 13 lbs. per ton of coal distilled. At the ovens of the Paris Gaslight Company from 10,000 to 11,500 cubic feet of purified gas were generally obtained from a ton of coal, which yielded from 69 to 70% of coke, fit for delivery to the railway companies.

Extracts, Notes, and Memoranda.

GLACIERS AND GOLD IN NOVA SCOTIA.—From a report on the gold property of the New York and Nova Scotia Gold Mining Company, by Prof. B. Silliman, jun., we extract the following remarks on the connection between glaciation and the gold deposits of that province:—"Over very considerable areas the glacial scouring has been so thorough that nothing whatever is left on the rocks but the grooves and striæ which accompany their polish. In other cases the glacial drift is seen composed of angular, rarely rounded, fragments of quartzite and clay slate, embedded in a tough clay, resting on the surface of the polished rocks. This detrital matter is auriferous, but the large amount of coarse, angular fragments of rocks would render it very difficult to wash, even when it occurs in situations where water could be conveniently obtained for sluicing. The gold which it contains is coarse and angular, often still attached to the quartz, and showing but little evidence of long transportation. The 'Boulder Lot,' at Sherbrooke, has yielded a considerable amount of gold from this glacial drift, and is rewarding its owners handsomely. Probably too little attention has been given in the province to this source of gold, the quartz veins alone having been the chief object of attention. * * * For a great part, of the whole coast, the glacial scratches, or the course of the glacial

drift has been almost at right angles to the strike of the rocks. These facts bear in a most important manner, it will be seen, upon the occurrence of the gold. They account, in fact, for the general absence of alluvial gold. * * * If we consider for a moment the physical and geological features just described, it at once becomes evident that the great mass of loose materials which came from the scouring off of the country by glacial action, has gone into the Atlantic Ocean, where the gold is safely deposited. Sable Island, which, by McKinley's map, is distant about 100 miles from the shore, is a sand-spit, thirty miles long by about half a mile wide, shaped like a bow, and consists entirely of an accumulation of loose white sands. Mr. Campbell, the provincial geologist, informs me that he washed gold from these sands in 1857, and that it was in very small, highly polished scales, like the fine gold of California. That it came with the sands which proceeded from the scouring off of Nova Scotia no geologist can doubt for a moment. It follows, from this view of the case, that the occurrence of extensive 'diggings' in Nova Scotia is a thing not to be expected. No long Sacramento Valley has retained here the spoils of the glacial epoch; and this fact appears to have been practically recognised from the outset, as comparatively few efforts have been made to obtain gold from any source but from the quartz veins. * * * The success following the washing of the sands near Lunenburg was, however, encouraging, and there are doubtless places of considerable extent in the numerous harbours and bays of the coast, where auriferous sands exist in remunerative abundance. The bottoms of some lakes, which can be drained, will probably furnish considerable deposits of alluvial gold; and the same is true, no doubt, of certain river estuaries and marsh lands which have hitherto attracted too little attention; such, probably, are the flats bordering on Chedabucto Bay."

THE MOST SUCCESSFUL COPPER MINE IN EUROPE.—The twentieth annual report of Devon Great Consols Mines has just been issued, from which we learn that, with an original outlay of 1,024*l.*—1*l.* per 1,024 shares, into which the mine was divided—the quantity of copper ore returned during the twenty years' working amounts to 397,396 tons, which realised 2,345,993*l.* Of this there has been paid in dividends 912,384*l.*, or nearly 900*l.* per share; and as these shares are now quoted at about 600*l.*, this will make a return of nearly 1,500*l.* per share for an original outlay of 1*l.* The greatest quantity of ore returned in one year was in 1857, when 28,836 tons were returned, in which year also the greatest amount of money was realised, reaching 159,432*l.* The largest amount paid in dividends in one year was in 1846, when 72,704*l.* were divided. During the past year 26,834 tons of ore were sold, realising 130,175*l.* The amount paid in dividends was 56,320*l.*, being 55*l.* per share. The ore reserves in the mines are estimated at 72,171 tons, which, at the average price realised by the ores sold during the past year, would give a money value of over 350,000*l.* The other available assets—consisting of machinery, plant, materials and ores on the mines; railway plant and houses; Government securities, money at call, bills receivable, and cash in hand—amount to 122,000*l.* With regard to the future of the mines, the report states that, considering the general appearance of the various workings, and the immense stock of ore in reserve, prospects have never at any time during the twenty years of their working looked more encouraging than they do at present.

A NEW AMALGAMATOR.—A late Californian invention is a new amalgamator, proposed by Mr. Disney, of San Francisco. It consists of a long cylindrical vessel, through which passes a shaft, with arms, upon which are affixed moveable shoes with convex faces, made to conform in shape to the inner surface of the cylinder, and upon the lower portion of this inner surface are affixed moveable dies. Both the shoes and dies are grooved

transversely, to give the same effect upon the pulp as is obtained by the transverse grooves of the ordinary pans. The grinding surface is confined to the lower portion of the cylinder; the shaft with every revolution passing the faces of its mullers over those of the dies. The mullers are so arranged as to be held to their places by springs, and can be completely raised from the dies by set screws.

INDURATION OF IRON.—The ironwork of the new bridge at Blackfriars is to be indurated by the following process patented by Messrs. Morewood and Co. The iron is to be thoroughly cleaned, and heated to the requisite temperature in a furnace planned by the inventors. When this temperature is attained, it is to be plunged into a bath of prussite of potash, and chloride of potassium, in a molten state, so that when the iron is withdrawn it may easily part with the surplus of the aforesaid chemicals, which should run off like oil. The iron is then to be dipped into boiling water, containing a certain proportion of cyanide of potassium; from thence it is removed to a bath for a final washing, and set up on end to dry. All the processes are to be carried on under cover, and before exposure to the atmosphere the iron is to be coated with an asphaltum paint twice, at given intervals; and again it is to receive two coats after fixing. Of course, all the necessary planing, drilling, and fitting is to be done preparatory to the indurating. The time the iron is to remain in the bath will vary from one to five minutes, according to the weight of the metal to be operated upon.

GÖTHITE FROM LAKE SUPERIOR.—This mineral is found associated with hematite at the Jackson Iron Mountain, near Marquette, Lake Superior. Some of the specimens have the hyacinth-red colour, which characterises the variety of göthite, called by the Germans "Rubinglimmer." It also occurs in acicular crystals of an almost velvet-black colour and lustre, and is occasionally found in distinct trimetric crystals.

NORTH OF ENGLAND INSTITUTE OF MINING ENGINEERS.—A general meeting of the members of this Institute was held at Newcastle, on May 5th. A paper was read by Mr. R. Howse, "Notes on the Glaciation of the Counties of Durham and Northumberland," and Mr. Thomas Sopwith's paper on the "Lead Mining District," was read *pro forma*. The discussion on the "True Geological Position of the Anthracite Coal," and on Mr. M. Dunn's paper on the "Probability of the Extension of the Coal Measures under the Red Sandstone of Carlisle" was postponed.

GEOLOGICAL SURVEY OF CALIFORNIA.—The San Francisco *Mining and Scientific Press* reports that the Legislature has passed the appropriation for the continuance, or rather for the partial summing up, of the work already done, of the geological survey of the State. It was understood that Professor Whitney was to leave for New York early in May, in order to superintend the publication of his report.

A NEW PROCESS OF AMALGAMATION.—Messrs. Adams and Worthington, of New York, have patented a new process of amalgamation, by which finely pulverised gold and silver ores are discharged in a shower into an atmosphere of hot vapour of quicksilver. This commingling of the pulverised ore and mercurial vapour is accomplished in a close chamber or passage-way, in which it is claimed the two substances mingle together in such a manner as to form a more perfect amalgamation than has been hitherto obtained. The novelty of this process consists in the peculiar manner in which the two substances are brought into contact.

AMERICAN ESTIMATE OF MR. DICKINSON'S GEOLOGICAL "THEORIES."—A late number of an American mining paper has the following observations on Mr. Dickinson's recent pamphlet, by which it will be seen what scant consideration that gentleman's ideas receive at the hands of the most prac.

tical people in the universe:—"Nothing is considered more positively established among scientific naturalists than the doctrine that the Mosaic account of the Creation is not to be literally interpreted. The geological changes which took place at the earliest periods are considered to be due to the operation of causes which are still in action; and the six days of Genesis to have been in reality as many *ages*, each of unnumbered years. Yet, strange as it may appear, a Mr. Joseph Dickinson, an F.G.S., an Ex-President of the Manchester Geological Society; an Honorary Member of an Institute of Mining Engineers, an Associate of the Royal Institution of Cornwall, and one of Her Majesty's Inspectors of Mines, has recently come out with a pamphlet entitled 'Modern and Scriptural Geology,' which, in despite of all analogical reasoning, and ignoring the researches and laborious investigations of the *savans* of the day, scouts the modern geological theories, and takes the ground that the watery mass of matter was, by a sudden act, divided by the firmament into heaven and the earth; that the fossils were created precisely where they are now found, and that the surface-rocks are at this moment just as they were left by the dividing firmament! What would Darwin and Lyell say to such extraordinary trash as this? But we beg pardon of our readers. The idea of writing a deliberate and serious article on the subject is almost as absurd in these days of enlightenment as the pamphlet itself. Neither the men above mentioned, nor any other man who has any name in the scientific world, will deign to bestow the slightest notice upon the production—they will treat it as the vague nonsense of an *insane man*. Mr. Joseph Dickinson, F.G.S., 'although he may have,' as he says, 'considered the subject for many years, and at last arrived at clear views upon it,' has now succeeded in most effectually extinguishing whatever reputation he may have previously acquired as a scientific man."

A NEW CONCENTRATOR.—Another recent Californian invention, by Mr. Prater of Washoe, is a machine designed as a concentrator and saver of gold, quicksilver, amalgam, and sulphurets. It consists of a pan with a convex bottom, discharging from the centre, and concentrating the gold and amalgam at the circumference. The motion is supplied by two small cranks, one upon either side of the pan, giving it a sort of shaking motion. It is intended to be placed after the ordinary pans and amalgamators, to save the fine particles of gold that will not amalgamate, as well as the finely divided quicksilver and amalgam, much of which is known to escape from the ordinary pans and separators in use. The apparatus so far is reported to have given very satisfactory results.

A NEW ALLOY.—M. M. H. Micolon, of Paris, proposes a new alloy for the manufacture of all metal articles, bells, hammers, anvils, rails, and non-cutting tools. The alloy consists of 20 parts of iron turnings or tin waste, 80 parts of steel, 4 parts of manganese, and 4 parts of borax; but these proportions may be varied. When it is desired to increase the tenacity of the alloy, 2 or 3 parts of wolfram are added. When the cupola is ready, the iron and steel are poured in, then the manganese and borax, and the vessel is filled up with coke.

BLASTING ROCKS.—Mr. D. S. Sutherland, of Great George-street, Westminster, proposes to introduce into the bore-hole a cone, either of wood or hollow metal, between the powder and the outer side of the hole. The apex of the cone is outward, and the hole is then filled up with sand, sufficient room only being left for the passage of the fuse. The effect of this cone is that the force of the explosion is much increased, the sand rendering the blowing out of the cone impossible.

MANUFACTURE OF SODIUM.—In the manufacture of this article Mr. Edward Sonstadt proposes to substitute gypsum or sulphate of lime for carbonate of lime, as the gypsum at once oxidises the carbonic oxide into

carbonic acid, which has no destructive effect on the sodium, of which a larger yield is obtained. The gypsum is well dried before it is used.

NEW MODE OF SMELTING LEAD ORES.—Prof. A. H. Everett, of New York, has patented an improvement in the reduction of lead from galena, by which a considerable saving of expense is effected. One of the common methods of reducing this ore is to mix it with iron in a reverberatory furnace; the sulphur, at a high temperature, having a stronger affinity for iron than for lead, leaves the lead and combines with the iron, forming a sulphide of iron, while the lead is drawn off as a separate metal. At the present time, however, the high price of even iron scraps in New York (about \$40 per ton), induced Prof. Everett to look about for some substitute, and it occurred to him to try the waste tin scraps of the tin-plate workers; in these he has the very best of wrought-iron, and in a form exposing the largest surface to the action of the sulphur. The tin scraps, being a waste product, can be had at a nominal cost. After a series of experiments the practical difficulties of the new process were overcome, and now several tons of ore are being smelted by it daily at Prof. Everett's furnace, at the foot of Horatio-street, in New York. The operation is very simple. 500 lbs. of the sulphide of lead are mixed with 125 lbs. of tin scraps in a reverberatory furnace and kept at an intense heat, the charge being stirred every fifteen minutes. In from one to two hours the whole mass becomes fluid, and the reduction is complete. It is found best to introduce one-half the charge of tin-scraps, and allow it to become red-hot, when the ore and the remainder of the scraps are added. Besides the cheaper and more rapid production of the ore by this process, the tin of the scraps is mixed with the lead, increasing the yield, and for many purposes improving the quality.

In the case of *Young v. Fernie*, Vice-Chancellor Stuart has given his judgment, as we anticipated, in favour of the plaintiff. He says, "it has been established to my satisfaction that the plaintiff Young is an inventor who has found out and introduced a manufacture which supplies the market for useful economical purposes with an article which was previously little more than the ornament of a museum, and that his patent is entitled to the protection of the law. * * * * Twice already has the validity of this patent been established before tribunals of high authority—first, before the Lord Chief Justice of England (Lord Campbell) and an English jury; next before the Lord President of the Court of Session in Scotland, and a Scotch jury."

Professor B. Silliman, jun., of Yale College, Connecticut, U.S., is making a tour of the mines of California and the border territories.

We have received the first number of a new Californian newspaper, to be specially devoted to mining, published at San Francisco, called the *Argus*.

We have to announce the death of Capt. William Richards, which took place at Redruth, in his 78th year. Capt. Richards was by birth a miner, being the son of the late Capt. Phillip Richards, formerly of Tincroft Mine, and also nephew of the late Capt. Thomas Teague, so well known in connection with mining in the Redruth district. Of late years Capt. Richards has been prominently before the public as the pursuer and manager of the successful mines of Wheal Basset, East Basset, and others in the neighbourhood: but during the half century he has been associated with Cornish mining he has had the usual chequered career in connection with mines in various parts of the county. Some years ago he held an important position in connection with Mr. Thomas Saunders Cave, in the re-working

of Old Great Fortune, Wheal Prosper, and several other mines in the St. Hilary district. Although there have been many more *enterprising* miners, it has been generally considered that as a *judicious* manager Capt. Richards had no superior among his contemporaries.

We also regret to announce the accidental death, on May 19th, of Mr. James Clarke, mayor of Helston, and purser of the old Great Work Mine.

We are again unavoidably compelled to postpone our notice of Dr. Percy's Metallurgy of Iron and Steel.

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ROGERS, A. — The Law of Mines, Minerals and Quarries in Great Britain and Ireland, with a Summary of the Laws of Foreign States, and practical directions for obtaining Government Grants to work Foreign Mines. (London, 1864.)

SAINTE CLAIRE-DEVILLE AND WÖHLER. — Darstellung und Eigenschaften des Bor. (Berg-Geist, No. 40.)

SCHORLEMMER, C. — On the action of Chlorine upon Methyl. (Proc. Royal Society, No. 63.)

SIERRA ALMAGRERA. — Estado de los productos en minerales argentíferos obtenidos durante el año de 1863 en las principales minas de Sierra Almagrera. (Revista Minera, No. 334.)

SHEPARD, C. U. — Mineralogical Notices. (Silliman's Amer. Journ., May.)

STRUTHERS, T. — Plain Papers on Geology. (Min. Journal, May 14.)

WATSON, J. Y. — Cornish Notes. (2nd Series, London, 1864.)

Patents relating to Mining and Metallurgy.

(Compiled from Commissioners of Patents' Journal.—Subject matter only given.)

UNITED KINGDOM.

APPLICATION FOR PATENTS FROM APRIL 26TH TO MAY 19TH.

- 1,050 (1864). J. RUSSELL, Machinery for hewing coal and other minerals.
- 1,058 (1864). B. F. BRUNEL, Improvement in treating titanite iron sands.
- 1,083 (1864). W. C. CAMBRIDGE, Improvements in the manufacture of iron.
- 1,107 (1864). P. A. L. De FONTAINEMOREAU (com. from J. E. AUSTRUY), Apparatus for washing ores and other substances, and in separating earth and other impurities adhering to them.
- 1,112 (1864). M. P. W. BOULTON, Improvements in obtaining motive power by the combustion of fuel.
- 1,114 (1864). E. H. NEWBY (com. from A. L. FLEURY), Manufacture of iron and steel.
- 1,121 (1864). B. HAMMERTON, Improvements in miners' safety lamps.
- 1,143 (1864). J. SHORTRIDGE, Manufacture of iron.
- 1,145 (1864). J. H. POOLE and J. ASTBURY, Improvements in puddling furnaces.
- 1,172 (1864). H. AITKEN, Mode of calcining and extracting the oil and gases from ironstone.
- 1,174 (1863). D. F. M. M. DEL REAL, Improvements in extracting silver from lead.
- 1,185 (1864). M. MORGANS, Improvements in blast-furnaces.
- 1,193 (1864). W. WEILD, Improvements in casting ingots from metal prepared by Bessemer's process.
- 1,196 (1864). T. M. GISBORNE, Improvements in kilns for burning limestone and ores.
- 1,244 (1864). G. HUNTER, Apparatus for cutting slate and coal.
- 1,262 (1864). T. DUNLEVIE and J. JONES, Improvements in metallic alloys.

PATENTS SEALED FROM APRIL 29TH TO MAY 23RD.

- 2,725 (1863). J. THOMAS, Improvements in preparing ores and earths containing copper for smelting.
- 2,743 (1863). J. WHITWORTH, Treatment of steel and homogeneous metal.
- 2,758 (1863). J. TOWNSEND, Manufacture of nitrate of potash.
- 2,886 (1863). W. WILLIAMS, Apparatus for the distillation of coal, peat, and other like substances used in the manufacture of solid and liquid volatile hydro-carbons and coke.
- 2,981 (1863). F. PAGE, Furnaces and apparatus for the manufacture of volatile hydro-carbons.
- 3,273 (1863). J. GJEBBS, Improvements in kilns for calcining ironstone and limestone.
- 2,819 (1863). W. E. GEDGE (com. from J. B. BAUX and A. GUIOD), Apparatus for amalgamating the precious metals.
- 491 (1864). P. H. MUNTZ, Manufacture of yellow metal sheathing.
- 665 (1864). A. V. NEWTON (com. from A. SMITH), Construction of cupola furnaces.
- 2,903 (1863). J. KIRKHAM, Treatment of certain ores of iron.
- 2,963 (1863). G. PARKIN, Apparatus employed in the manufacture of paraffin and other like oils from shale, cannel and other minerals.
- 3,213 (1863). W. H. TOOTH, Manufacture of iron and steel.
- 605 (1864). J. CLAYTON, Improvements in reverberatory and other furnaces for heating and melting iron and steel.
- 795 (1864). W. E. NEWTON (com. from N. J. JACQUET), Machinery for boring rocks.

PATENTS ON WHICH £50 DUTY HAS BEEN PAID FROM MAY 12TH TO
MAY 14TH.

- 1,310 (1861). R. MUSHET, Improvements in casting ingots of steel.
1,302 (1861). G. E. DONNETHORPE, Apparatus used in getting coal.

PATENT ON WHICH £100 DUTY HAS BEEN PAID, ON MAY 3RD.

- 1,303 (1857). C. E. DARBY, Improvements in collecting the inflammable gases generated in blast-furnaces.

PATENTS VOID BY NON-PAYMENT OF DUTY FROM APRIL 23RD TO MAY 14TH.

- 1,055 (1861). J. MARSHALL, Improvements in preventing the fracture of metals from crystallisation.
1,174 (1857). W. CORY, Manufacture of coke.
1,084 (1861). R. LAING and I. SWINDELLS, Treatment of certain ores containing metals, and obtaining products therefrom.
1,117 (1861). W. E. NEWTON (com. from J. M. PUISTIENNE), Treatment of copper ores.
1,288 (1857). H. MACKWORTH, Improvements in the apparatus made use of in the classification, preparation, and treatment of mineral substances, coke and furnace cinders.
1,214 (1861). T. BELL (com. from L. Le CHATELIER), Improvements in the decomposition of the compounds of aluminium, and in coating metals with aluminium or its alloys.
1,223 (1861). W. CLARK (com. from L. J. F. MARGUERITE and A. L. DE SORDEVAL), Manufacture of steel.

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AUSTRIA.

PATENTS DELIVERED, PROLONGED, AND BECOME VOID DURING FEBRUARY.

94. A. GAY-CATALAT and I. H. COTTIN, Improvements in converting cast-iron into cast-steel, malleable, and refined iron. [Delivered.]
68. J. VON ROLTHORN, An alloy of copper, zinc, tin, and iron. [Prolonged.]
82. C. PREISENHAMMER, Improving the quality of pig and rod iron by alloys of tungsten. [Prolonged.]
51. A. L. S. CHENOT, Apparatus for compressing and solidifying metallic sponges, pulverised ores, and the agents acting thereon. [Become void.]
60. J. PIDDINGTON, Manufacture of fuel cakes of small coal, charcoal, and brown coal. [Become void.]

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BELGIUM.

PATENTS DELIVERED FROM MAY 1ST TO MAY 15TH.

- 16,014. J. B. SIMONNET and A. COUANNIER, Treatment of silver ores.
16,095. J. B. HELSON, A furnace for reducing, cementing, and smelting iron and other ores.
16,103. A SMITH, Construction of crucibles for smelting metals.
16,111. J. E. AUSTRUY, A trunk-buddle for iron and other ores.
16,115. C. M. T. DU MOTAY and E. KARCHER, Manufacture of fluoride of silicium.
16,117. J. VERHEVICK, An apparatus for distilling mineral oils and other explosive substances.

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FRANCE.

CURRENT LIST OF PATENTS.

- 60,920. SOLVAY, Apparatus for the direct manufacture of carbonate of soda.
60,932. DINANT, Fastening safety lamps for miners.
60,991. FIRTH and STURGEON, Machines for cutting coal and other ores.
61,002. OTTO-SIEMENS, Manufacture of sulphurous acid, and especially carbonate of soda.
61,003. PARENT, SCHAKEN, CAILLET and Co., Round buddle for washing ores, with a fixed conical table, and with a basin ascending by means of a mechanical motion.

SWEDEN.

PATENTS DELIVERED DURING 1863.

2. O. E. ROSENGREN and G. SVEDEBUS, Extracting nickel from ores, and alloys of metals or oxides or sulphurets containing the same.
4. G. SVEDEBUS, Extracting copper from ores.
14. C. ATTWOOD, Manufacture of steel, and iron resembling steel.
15. A. WALL, A process for extracting pure lead, and also separating silver therefrom by means of electric currents.
19. J. and C. G. BOLINDER, Manufacture of a kind of furnace for drawing iron.
29. C. G. BARTHELSSON, A machine for boring tunnels.
82. C. G. BARTHELSSON, Improvements in machines for boring tunnels.
85. F. BERGENDAL, A furnace for welding iron.
87. C. E. HEDLUND, Manufacture of plates of steel and iron welded together.
94. A. F. PAUL, A glass smelting furnace.
95. A. MULLER and Co., Direct manufacture of cast-iron, rod iron, and steel.
96. A. MULLER and Co., Manufacture of zinc in blast-furnaces, and the preparation of other metals and metalloids.
116. A. E. ALMEN and G. BUSCK, A blast-engine.

UNITED STATES.

PATENTS ISSUED FROM APRIL 12TH TO MAY 3RD.

- 42,341. J. A. BEETOLA, Improvements in "Chilian mills" for pulverising metallic ores.
- 42,371. W. H. HEPBURN and G. K. PETERSON, Machine for grinding and amalgamating gold and silver.
- 42,372. C. D. HICKS, Improved ore separator.
- 42,392. F. A. MORLEY, Improved ore separator.
- 42,407. R. ROWLAND, Manufacture of white lead.
- 42,441. L. G. MARSHALL, Improvements in desulphurising metals and ores.
- 42,446. F. M. RUSCHHAUPT, Improvement in puddling furnaces.
- 42,453. T. ALLIN, Improvement in hardening cast-iron.
- 42,470. E. HALL, Improved smelting furnace.
- 42,558. N. CARPENTER, Improved machine for cleaning and separating ores.
- 42,570. A. H. EVERETT, Improvement in smelting lead ores.
- 42,596. H. PIETSCH, Improved ore separator and amalgamator.
- 42,626. T. HANISON, Mode of cutting coal and other minerals.

SPECIFICATIONS PUBLISHED, AND PRICES.

FROM APRIL 23RD TO MAY 21ST.

** Specifications will be forwarded by post on receipt of price and postage at Her Majesty's Patent Office, 25, Southampton Buildings, London, W.C.—The amount of postage may be estimated from the price, as follows:—Where price does not exceed 1*s.* 6*d.*, postage will be 1*d.*; above 1*s.* 6*d.*, and not exceeding 3*s.* 4*d.*, it will be 2*d.*; above 3*s.* 4*d.*, and not exceeding 6*s.* 4*d.*, it will be 4*d.*.—Sums exceeding 6*s.* must be remitted by P. O. O., on Holborn Office, payable to *Bennet Woodcroft*.

- 2,203 (1863). L. MOND, Obtaining sulphur and sulphurous acid from alkali waste; 4*d.*
- 2,234 (1863). W. CLARK (com. from J. E. D'ARCY), Purifying and disinfecting hydrocarburets; 4*d.*
- 2,245 (1863). M. GERSTENHÖFER, Furnace for roasting pyrites; 1*s.* 4*d.*
- 2,251 (1863). D. S. Sutherland, Blasting rocks; 6*d.*
- 2,277 (1863). J. McEWEN, Coke ovens; 10*d.*
- 2,283 (1863). F. DE WYLDE, Manufacture of silica; 4*d.*
- 2,293 (1863). G. DAVIES (com. from W. GERHARDT), Manufacture of iron and steel; 10*d.*
- 2,357 (1863). J. STURGEON, Cutting and boring coal and rocks; 1*s.* 4*d.*

Current Review of Mining, Quarrying, and Metallurgy.

CORNWALL, DEVON, AND WEST SOMERSET.

Mining in Cornwall has been slack during the past month, and there have been no alterations in mines worthy of especial notice. The tin standard still continues to decline, although not so heavily as has been the case for some time past; the copper standard on the whole remains about stationary. The new setts in the Wheal Vor and Chiverton districts, which have lately been brought out in such shoals by the brokers, are evidently overdone; indeed, as things stand at present there seems little chance of a third of them ever being carried out in a minerlike manner.

At the Stannaries Court sitting on May 14th, the Vice-Warden made an order that the affairs of the *Old Wheal Neptune* Mining Company should be wound up under the inspection of the Court, and appointed Mr. W. Polkinghorne, of Tywardreath, liquidator, in the room of Mr. Pulbrook. An order was also made for the winding up of *Cornubia* Mining Company. In the case of *West Par Consols*, which involved the question of whether or not a shareholder in a mine makes himself liable to a call, merely by the fact of his presence at the meeting when the call is made, without his consent being recorded in writing, assuming that the call is illegal as regards the general body of shareholders in consequence of a minority of the shares only being represented, the Vice-Warden decided against the shareholder, as he held that although the audits of accounts, when the calls in question were made, were not allowed by the majority in value of the shareholders of the mine, yet as the shareholder in question was present at the audits, and had since recognized the calls, he could not now take objection to their legality, and was bound by the calls which, in fact, he himself had sanctioned and subsequently approved of.

We refer in another part of this number to the death of Captain William Richards. Some interest is felt at Redruth as to who will succeed in the management of the different mines with which he was connected. Mr. F. W. Dabb, of Redruth, who for many years has been the confidential clerk of Captain W. Richards, is a candidate for the pursership of Wheal Basset, and a circular has been issued by gentlemen representing nearly 200 shares, (wishing to place Mr. Dabb in as purser, and Captain Pope as managing agent), calling a meeting for May 30th; these gentlemen are in favour of a committee of management. Captain Thomas Richards, son of the late purser, is desirous of succeeding his father in the management, so that a severe contest is anticipated.

The principal alterations in mines during the month have been as follows:—At *Sithney Carnmeal* there has been an important discovery in the 95 west, where the lode is reported worth 150*l.* per fm. *Great Wheal Fortune* is reported to be looking better. *Wendron Consols* continues poor. *Wheal Trannack* is said to have improved. There appear to be very conflicting reports with regard to the position of *East Lovell*, but from them all there seems to be no doubt that there is a good bunch of tin whatever its extent may be. *Great Wheal Vor* continues to look well, although Ivey's shaft has not yet entirely got through the slide. At *Wheal Grylls* the Georgia lode, which has been poor, has improved to 5*l.* per fm. As an instance of the value of perseverance in mining we may refer to the case of *Wheal Margery*, which about 18 months ago it was determined to stop, but being continued for a few weeks led to a discovery which resulted in the mine being placed in a position to take the chair at the ticketing of May 12th. *Rosewarne Consols* is reported to have improved. At *Wheal*

Kitty (St. Agnes) Pryor's lode in the 44 and 54 is said to have fallen off; the 34 fm. level ends east and west are worth 28*l.* per fathom.

Wheal Seton, on the whole, is reported never to have looked better. Tilly's shaft will yield 24 tons of ore per fm.; the sump winze 18 tons per fm. At *Wheal Agar* an improvement is reported on the 80 east of East Pool lode. The reports from *East Pool* continue good although the returns have slightly fallen off. At *Carn Camborne* the south lode in the 30 east and 30 west are reported to be each worth 2 tons per fm. The lode in the 65 west at *East Grenville* is said to be worth 6 tons of ore per fm. At *Wheal Grenville* the lode was touched on the 25th, but enough of it has not been seen to report definitely on it. *West Frances* is reported to be looking better. About 45,000*l.* has been expended on this mine, and it is now hoped that the adventurers will be rewarded for their perseverance. At *Wheal Buller* the 90 west of Kissler's is reported to have improved and to be now worth 14*l.* per fm.

At *Wheal Rose* it is reported that although some points have fallen off, others have improved. The whim-shaft is holed to the 80 and it is said that the lode is worth 60*l.* per fm. all the way. The 80 east is not yet driven from the cross-cut, but that end is reported worth 70*l.* per fm. There is said to be an improvement in River shaft at *Great North Downs*. *Great Wheal Busy* is said to be looking well, also *Boscawen* adjoining it. At *Nanjiles* the shaft which was reported to be looking well in the early part of the month is said to have latterly fallen off.

At *West Chiverton*, the 80 west on Valpy's lode is worth 70*l.* per fm. The 80 west on Williams's lode is worth 80*l.* per fm.

Among the Eastern Mines the report from *East Caradon* shows a falling off, the ends in the aggregate being reported worth 106*l.* per fm.

As to Devonshire mines, *Frank Mills* (Christow) is said to be looking very well, a good lode having been intersected in the 100, the end producing 1 ton of lead per fm.

Among transactions at mine meetings during the month have been:— At *West Frances* meeting (on May 9th, it was announced that Mr. Fortescue had consented to grant a new sett for 21 years, and to reduce the dues from 1-15th to 1-18th. At *North Robert* (on the 10th) it was resolved that, as Mrs. Collier had consented to reduce the dues to 1-20th, vigorous operations at the mine should be resumed. At *South Frances* meeting (May 19th) a report of the committee was presented, stating that Mr. Basset had consented to continue the lease of the sett, so far as his interest was concerned, for a term equal to the present sett of West Basset, provided he was indemnified against any liability or loss. The committee stated that they had used their best efforts from time to time to settle the boundary dispute with West Basset, but without effect; and a few days before the meeting another but ineffectual effect had been made through the kind mediation of Sir R. R. Vyvyan, who suggested either that the Court of Error be invited to decide on the merits of the case, and that, in the event of their consenting to do so, their judgment be accepted as final, each party pledging itself to abide by the decision of the said court, and to pay its own costs: or that both companies agree to take the two verdict lines as boundaries of a barrier or neutral ground, which is to be worked in common by both companies during 21 years: the profits to be equally divided, all litigation to cease, each party paying its own costs; both mines to have new setts for 21 years. At *West Basset* meeting (May 25th), on the contrary, in referring to the statement of the South Frances Committee, that they had used their best efforts to settle the dispute, it was stated that they had done nothing of the kind, whilst the West Basset Committee had offered every reasonable concession, and had even proposed to divide the matter in dispute, which would have saved 8,000*l.* in law costs. The committee regretted they could not accept Sir Richard Vyvyan's proposition,

which, in fact, amounted in substance to this : that the West Basset Mine relinquish the verdict in their favour for the boundary line south of Vincent's house ; relinquish the damages consequential upon such verdict, and the costs of the trial ordered to be paid them by the rule of the Court of Queen's Bench, if there should be any further trial ; and allow the South Frances Mine to retain nearly 1,800*l.* paid them under the certificate of the referee. The chairman (Mr. W. A. Thomas) thought that the most important thing was that Sir Richard Vyvyan had declined to be a party to the new grant to South Frances, and he thought that he had thus entitled himself to their warmest thanks. Mr. Basset alone had the power to grant the lease, but it required the confirmation of Sir Richard Vyvyan ; and if Mr. Basset determined to grant in opposition to him, Sir Richard Vyvyan had power to demand one-half of the minerals, which amounted to a *veto*.

Among the new companies brought out during the past month have been :—The *Tavistock Iron Works and Steel Ordnance Company, Limited*, with a capital of 200,000*l.* in 10,000 shares of 20*l.* each, of which one-half is first issued, formed for the purpose of purchasing and working Messrs. Gill's foundry at Tavistock. The business of this establishment has been for some years in a decaying state, and, according to present custom, in the case of such businesses it is now formed into a limited liability company. It is difficult to understand how any business in working iron and steel, other than supplying the mines, can with advantage be carried on at a place so far removed as Tavistock from the raw material. The *Great Wheel Metal Mining Company*, referred to in our last number, have reduced their capital to 20,000*l.* in 10,000 shares of 2*l.* each.

WALES AND THE BORDERS.

SOUTH WALES.—The iron trade has been moderately active, and although the pressure in the money market has exercised a depressing influence on the trade, yet the first-class makers have their books in the majority of instances full of orders, and even the second-class makers do not complain that they are in actual need of orders. The proposed substitution of 50% import duty on imported goods and articles to the Northern States instead of the present per centage, which averages from 10 to 20% has given a decided check to the American trade, and until additional mails arrive with more complete information, hardly a specification will be given out on American account except to complete old contracts.

The *Abernant Iron Company* are extending operations at Llwydcoed, and the *Golwyns Iron Company* are about to blow in another furnace. The *Rhymney Company* are also making arrangements to increase the make, and the armour-plate mill will, it is said, be one of the largest and most extensive in the world. It is reported that Mr. Bethell, brother of Lord Chancellor Westbury, intends erecting blast-furnaces at *Llanharry*, where he has already spent a large capital in developing the iron ore deposits and in opening a colliery. Messrs. Hind and Co have made a start at *Hirwaun*, part of the works being already in operation, and hundreds of hands will shortly receive regular employment. Iron shipbuilding is becoming an important branch of trade at the South Wales ports, there being no less than three iron ships now in the course of building at Cardiff. It is expected that the iron trade will receive considerable benefit from this activity, and that a large demand will arise for plates and other description of iron required for shipbuilding purposes.

The *Times* remarks that "The announcement that the import tariff is to be increased to 50% in the Federal States has given a decided check to the demand for tin plates on American account, and during the continuance of this high protective duty the shipments to that country will, it

is expected, be greatly reduced. The new tariff, it is stated, is only a temporary measure adopted to provide the necessary funds for the Federal authorities; but it is feared that, once imposed, Mr. Lincoln's Government will not show any particular anxiety to remove the impost. Although an important market for tin plates is thus materially restricted, the makers seem to have confidence in the future, for several new works are in progress, and within the last few weeks two large establishments have been opened in South Wales, one at *Melyncryddan*, near Neath, and the other the New *Vernon Works*, Britonferry, built by Messrs. Smith, Morris, and Co. The difficulty with the men as to the rise in wages has been arranged at the majority of the works, and where turn-out have taken place either fresh hands have been obtained, or the old workmen have returned to their work."

The coal trade has, upon the whole, been in an active state, and the demand continues brisk for both house and steam-coal. The closing of the West Bute Dock, *Cardiff*, for repairs, operates prejudicially to the trade to some extent, but this is only a temporary difficulty, and it is hoped that in a few weeks the repairs will be completed. The powerful new pumping-engine has been completed at *Abercarn*, and this colliery promises to become one of the most extensive and valuable in the locality. The *Machen* Company have commenced working their new colliery at *Bedwas*, and the necessary arrangements are being made for sinking a second shaft. The *Bryntail* Colliery, the property of Messrs. Davies, Dichett, and Davies, has just commenced working. The colliers continue to remain in a very unsettled state, and show every determination to enforce their demand for another rise of wages. In two or three of the Aberdare collieries the hauliers have left in a body, and in others the men have determined to strike unless their demand is complied with. The Masters' Association have resolved not to allow the demand, and have taken measures to prevent the men who have left their work getting employment in any of the association collieries. Steps have also been taken to support any master whose men may strike. Altogether at the present time there is a greater probability of a strike than has yet been the case.

During the month of April the number of vessels that entered the port of *Cardiff* reached nearly 800, and upwards of 700, again cleared. The exports were 123,900 tons of coal, 17,800 tons of iron, 2,500 tons of patent fuel, and 500 tons of coke. This shows a considerable decrease in coal as compared with the corresponding month of last year, and the decrease is expected to be still larger during May, owing to the closing of the West Bute Dock for repairs to the gates. A large quantity of pig-iron and iron ore was also imported.

During the month of April the exports for abroad from *Newport*, were 23,709 tons coal and 11,355 tons iron, against 12,263 tons coal and 7,000 tons iron in the corresponding month of last year, and the shipments coastwise were 47,774 tons. 566 vessels, with an aggregate registered tonnage of 66,138 tons, were engaged in the trade of *Swansea*, being an increase of 55 ships and nearly 10,000 tons tonnage as compared with April, 1863. The coal exports was 47,636 tons to foreign countries, and 24,251 tons coastwise, being a large increase on both the previous and corresponding months. *Llanelli* exported for abroad 13,927 tons coal, against 15,618 tons in the corresponding month, and coastwise 26,894 tons, against 24,741 tons in the month of March.

The arrivals into *Swansea* include:—Copper ore from Cuba, Almeida, and Aveiro; copper regulus from Cuba; and unwrought copper in bars from Guayan; and iron ore from Nantes, Cherbourg, and Santander.

GLOUCESTERSHIRE.—A new company has been announced called the *Ashton Vale Iron Company, Limited*, with a capital of 150,000*l.*, in 6,000 shares of 25*l.* each; the object of which is to purchase and work the Ashton

Vale iron ores, and to establish the manufacture of wrought and finished iron in the immediate neighbourhood of Bristol.

Among the imports in Bristol during the past month may be noticed: 90 tons of silver-lead ore from Douglas; 28 barrels of sulphur from Liverpool; 153 tons of sulphur ore from Arklow; 135 tons of pig-iron from Workington; 15 barrels of iron ore from Liverpool; and 73 tons of iron from Porthcawl. During the month of April, 1,410 tons of coal and 810 tons of iron were exported from Bristol, against 836 tons of coal, and 3,675 tons of iron in the preceding month, showing an *increase* of 574 tons of coal, but a decrease of 2,865 tons of iron. Compared with the corresponding month last year, when 1,677 tons coal and 591 tons iron were exported from Bristol the above returns show a *falling off* in the shipments of coal of 267 tons, but an *increase* of 291 tons in the exports of iron. The imports into Gloucester include: 250 tons of coal, 313 tons of pig-iron, and 46 tons of bar-iron. The exports include: 438 tons of iron; 379 tons of coal; and 437 tons of burnt ore.

MONTGOMERYSHIRE.—A new company is announced called the *Tynnewydd Silver-Lead Mining Company*, which has been formed with a capital of 15,000*l.*, in shares of 2*l.* each, for the purchase and working of the Tynnewydd, Moelgolomen, and Bwlch-glas mining setts. The purchase-money is fixed at 4,750*l.*, of which 1,250*l.* is to be paid in cash, and the remainder in paid-up shares.

MIDLAND COUNTIES, SOUTH LANCASHIRE, AND SOUTH YORKSHIRE.

STAFFORDSHIRE AND WARWICKSHIRE.—The iron trade has been dull all through the month, there having been little demand for manufactured. Pig-iron has not been selling, and the make in this district has decreased to the extent of from 1,500 to 2,000 tons a week upon the quantity that was being made at the close of last year, and the result has been to seriously diminish the quantity of coal and stone got here, and to occasion a considerable reduction in the demand for the produce of other districts. Several furnaces have been put out of blast.

The coal-trade has been inactive, especially as regards house-coal, for which there has been little demand. The colliers about *Bilston* are resisting the reduction of 3*d.* per day in their wages, and the masters are considering whether they may not as well grapple with the difficulty of a further reduction, which it is generally felt must soon take place. It is, however, the impression that the 3,000 men that have turned out will soon resume work, as they have not received as much support from the Miners' Union as they expected.

The prospectus has been issued of a new company called the *Wincote Collieries and Blue or Iron Brick Company*, limited, with a capital of 100,000*l.* in 10,000 shares of 10*l.* each, the object of which is to purchase and work a mineral property near Tamworth.

NOTTINGHAMSHIRE.—Shireoaks Colliery, near Worksop, is about to be worked by a new limited company called the *Shireoaks Colliery Company*, with a capital of 130,000*l.*, in 6,500 shares of 20*l.* each. This colliery has been hitherto worked by the Duke of Newcastle.

DERBYSHIRE.—The iron trade has been in a very satisfactory state, and a good deal of business has been done. The coal trade, considering the season of the year and heat, has been very busy.

The *Devonshire Silkstone Coal Company*, with a capital of 30,000*l.* in shares of 10*l.* each, has been formed for winning and working a field of "black shale" coal, situated about three miles north of Chesterfield.

SOUTH YORKSHIRE.—The strikes in the coal and iron-trades of this district still continue, nor does there seem any chance of their terminating soon. Various meetings have been held both by the colliers and puddlers, but no satisfactory result has been arrived at.

NORTHERN COUNTIES, NORTH LANCASHIRE, AND NORTH YORKSHIRE.

NORTHUMBERLAND AND DURHAM.—The iron trade of this district has been somewhat stationary, and stocks have a tendency to accumulate, as there is no pressure of orders. Prices are about the same. The present partial dulness in the iron trade, however, in no way retards the extension of iron manufactories in the Cleveland iron district. With respect to this the *Darlington and Stockton Times* remarks that the make may now be roughly estimated at 1,000,000 tons per annum, as in addition to the seventy furnaces named below there are the furnaces at Washington, Birtley, Seaham, Felling, Jarrow, Walker, and Wylam, say eighty-five altogether in blast, and producing on an average 230 tons per week each at least. If only twenty of the furnaces now building are in blast by the end of next year, they will increase the make by fully 300,000 tons per annum, and before the expiration of the year 1866, it is probable that the whole make will not be less than one million and a half tons per annum. It is known that land is purchased, and capitalists are preparing to go on with the erection of blast furnaces at Darlington, Fighting Cocks, Middlesbro', Normanby, and other places; and there seems now no lack of confidence whatever in the profitability of making iron to any extent from the

Place and Owners.	In.	Out.	Total.
Eston — Bolckow and Vaughan	9	—	9
„ Clay Lane Company	3	—	3
„ South Bank Company	3	—	3
Cargo Fleet—Jones, Dunning and Co.	2	—	2
„ Cochrane and Co.	4	—	4
„ Gilkes, Wilson, Pease and Co.	5	—	5
Middlesborough—Bolckow and Vaughan	4	—	4
„ Hopkins and Co.	2	—	2
Port Clarence—Bell Brothers	6	—	6
Norton—Warner, Lucas and Barrett	3	—	3
Stockton—Holdsworth and Co.	3	—	3
Ferry Hill—J. Morrison	3	—	3
Thornaby—W. Whitwell and Co.	3	—	3
Darlington—South Durham Company	3	—	3
Witton Park—Bolckow and Vaughan	4	—	4
Stanhope—Weardale Iron Company	1	—	1
Towlaw—Weardale Iron Company	5	—	5
Consett—Derwent Iron Company	7	11	18
Total	70	11	81
All places, May 1st, 1863	61	19	80
„ „ 1862	54	25	79
„ „ 1861	50	26	76
„ „ 1860	53	16	69
„ „ 1859	56	11	67
„ „ 1858	43	20	63

Cleveland stone. The manufacture of plates, bars, and other iron is making great progress also. The works of Messrs. Barningham, Hopkins, and others have been, and are still to be further extended; Messrs. Pease, Hutchinson, and Ledward, at Darlington, are already doing a considerable business; and Messrs. Fox, Head, and Co., at Middlesbro', and other firms promise to be at work in a short time. With most parties who are erecting the different descriptions of ironworks want of suitable material is a serious hindrance. The state of the blast furnaces of the Cleveland district on the 1st of May, 1864, was as shown by the table.

Statement of iron furnaces now in course of erection :—

	Building.	Foundations Ready.
Eston—Bolekow and Vaughan	2	—
„ Clay Lane Company	3	—
„ South Bank Company	3	3
Cargo Fleet—Jones, Dunning and Co.	1	—
„ Gilkes, Wilson, Peace and Co.	2	1
Middlesbro'—Hopkins, Lloyd and Co.	4	2
Port Clarence—Bell Brothers	2	—
Ferry Hill—James Morrison	4	—
Newport—B. Samuelson	3	—
	24	6

The steel works which Mr. Charles Attwood and partners have erected in the neighbourhood of *Tow Law* have been opened, and it is said that cast-steel will be manufactured there by a process discovered by Mr. Attwood, at a much reduced cost.

The coal trade has been brisk as regards manufacturing sorts, but household coal has been rather slack. The pitmen's strike at *Seghill* Colliery has terminated to the satisfaction of both masters and men. The *Hunwick* and *Newfield* Collieries were offered for sale at Newcastle, when they were bought in at the reserve price of 80,000*l.* They were then offered in separate lots, when the Newfield Colliery was bought for 20,000*l.*; 45,000*l.* was offered by Mr. Hoyle for Hunwick Colliery, the reserve price being 60,000*l.*, and it is expected that the property will be ultimately disposed of to him by private contract.

A prospectus has been issued of the *Harehope Gill Lead Mining and Smelting* Company, with a proposed capital of 100,000*l.*, in shares of 5*l.* each, with the object of purchasing the plant and the residue of seventeen years of the lease of a mining estate of about 900 acres at Weardale, Durham. The consideration for the purchase is to be 40,000*l.*, half in paid-up shares and half in cash, which will include preliminary expenses.

The exports from the Tyne include :—142,435 tons of coal; 8,866 tons of coke; and 38,542 cwt. of iron. The imports include :—Three cargoes of pyrites from Antwerp, and five cargoes from Pomaron; three cargoes of sulphur pyrites from Dordt; bar iron from Gothenburg; lead and copper from Almeida; copper ore from Santander; three cargoes of lead from Carthage; 1,320 pigs of lead from Seville, and 1,847 bars of the same from Alicante.

NORTH YORKSHIRE.—Discoveries of the ironstone deposits of the North Yorkshire moors are constantly being made. In addition to the great band in Rosedale and the Gothland mines, the ore has been found at Belsdale, and in the whole of the valleys opening to the vale of Pickering. In the

Howardian hills, in the Derwent Valley, some four miles west of Malton, it has been slightly worked. On the stagnation in the trade the workings ceased, but they are now being reopened by a Company of Scotch capitalists. At Oldstead, two miles from Coxwold, ironstone has also been discovered; and the Keldy-castle estate, near Pickering, has been found to contain a valuable and easily worked seam, only a little below the surface. It is proposed to make Hull the depôt for supplying pig-iron from the Yorkshire moors, both for exportation and home consumption.

SCOTLAND.

The coal-trade has been dull during the past month, with regard to home consumption, but the demand for export has been pretty good, and the shipments from the various ports still continue on the increase.

The market for all kinds of iron has been very quiet, and prices have been almost nominal. Some makers are said to have large contracts on hand, but they experience a difficulty in obtaining specifications.

The *Colliery Guardian* gives the following statistics on the Scotch export pig-iron trade during the quarter ending March 31st, 1864, as compared with the corresponding three months of the previous three years:—

Week ending			1864.	1863.	1862.	1861.
			Tons.	Tons.	Tons.	Tons.
January	2	.. ..	5,656	5,473	7,707	5,202
"	9	.. ..	5,253	6,520	8,882	7,280
"	16	.. ..	9,928	7,203	9,308	9,266
"	23	.. ..	7,805	6,162	8,915	9,771
"	30	.. ..	9,834	4,609	9,917	7,748
February	6	.. ..	10,690	6,922	11,122	9,083
"	13	.. ..	12,312	10,584	7,961	8,291
"	23	.. ..	10,769	9,896	9,627	6,616
"	27	.. ..	12,072	11,465	10,904	9,080
March	5	.. ..	13,936	11,796	9,042	7,777
"	12	.. ..	19,787	12,324	12,011	7,982
"	19	.. ..	12,713	16,394	12,158	8,206
"	26	.. ..	15,089	10,395	11,284	10,169
Totals			145,844	120,243	128,838	103,811

The exports per month were:—

Month.			1864.	1863.	1862.	1861.
			Tons.	Tons.	Tons.	Tons.
January	..	.. ..	38,476	30,467	44,729	39,267
February	..	.. ..	45,843	38,867	39,614	33,070
March	..	.. ..	61,525	50,909	44,495	33,474
Totals			145,844	120,243	128,838	103,811

The trade appears from this to be in a highly satisfactory condition, as the figures for the first quarter of 1864 show an increase of 25,601 tons over the corresponding period of 1863, of 17,006 tons over the corresponding period of 1862, and of 42,033 tons over the corresponding period of 1861.

An accident occurred at *No. 1 Croy Ironstone Pit*, Dumbarton, by the explosion of a bore, which resulted in the death one man, and serious injury to another.

CONTINENT OF EUROPE AND MEDITERRANEAN COUNTRIES.

FRANCE.—The iron trade at *St. Dizier* still continues in a depressed state, orders have slackened, and quotations of pig have given way. Proprietors of blast furnaces and the ironmasters are complaining of their position; the former because, having purchased wood in order to produce at 4*l.* 16*s.* per ton, prices are now 4*l.* 12*s.*; and the latter because pig even at 4*l.* 12*s.* should carry the price of iron to 9*l.* 10*s.* 6*d.* per ton, while present rates are below that. It is reported that the introduction of coke into the *St. Dizier* district is on the increase, and two furnaces near *Joinville* are about to be adapted to the manufacture of both coke and charcoal pig. The accounts of the *Loire Mining Company* show a credit balance of 40,250*l.*, which allows of a dividend of 9*s.* 6*d.* per share. The *Carmaux Mining Company* has declared a dividend of 14*s.* 3*d.* per share. The *Caronte Works* are to be offered for sale for 8,000*l.* The firm of *Wendel* will soon have eight furnaces at work at *Hayange* and *Moyeuvre*, capable of turning out in the aggregate 300 tons per day.

From the statistics published by the committee of French colliery proprietors it appears that the production of the French coal mines has exactly doubled during the 10 years from 1853 to 1863, being 5,000,000 in the former year against 10,000,000 in the latter.

BELGIUM.—The iron trade in the *Charleroi* district has been very quiet during the past month. Good qualities of casting pig have been more in demand than ordinary sorts, and prices are more easily maintained for the former. The introduction of Belgian pig into England continues to attract considerable attention, and it is stated that the products forwarded gave great satisfaction, having been found to be of good quality and specially adapted to the manufacture of plates and bar iron. New rolling works for rails have been put into activity by the *Châtelineau Company*. An Austro-Belgian company has purchased from the Austrian Government large quantities of Carinthian ores, which are to be shipped from Trieste to Antwerp. A ministerial decree has been issued rendering the use of the Museler lamp obligatory in Belgian Mines, except in cases where "a lamp of that type might give rise to grave inconveniences."

The *Vieille Montagne Zinc Company* have held their annual general meeting at Angleur. It appears that the company's metallic mines and collieries in Belgium and Prussia, conducted with much attention and foresight, pursued their regular course of working last year, and furnished a total production of calamine, blende ore, galena, coal, and various ores to the amount of 147,162 tons. The installation of the lower centre of working in the company's principal mine of Moresnet, on the neutral territory, will only be completed at the end of the present exercise. The present working of calamine, which is effected above the level of 216', will be carried in 1865 to the level of 300'; and while this working follows its course, a new stage will be proceeded with at a depth of 400'. The company's Rhine mines are being developed in a satisfactory manner; some fine metalliferous masses—argentiferous blende and galena—have been met with, which assure a profitable working for some time to come. The mechanical apparatus at work in the company's mines, which has been constantly improved for ten years past, is now fully equal to the requirements of the various workings. In the Belgian part of the *Vieille-Montagne* concession, as well as at the *St. Paul Mine*, and round *Welkenraedt*, important explorations have been conducted as to the prolongation of the sulphur deposits of *Welkenraedt*, while new deposits have been discovered containing calamine,

blende, galena, carbonate of lead, and pyrites. The directors have hastened to apply to the Government for the extension of the concession, to which they consider that the discoveries made entitle the company. The purchases of foreign ores, raw and roasted, made last year in Spain, as well as in the Rhenish provinces, amounted to 29,374 tons. A dividend of 16s. per share was declared.

The *Charleroi* Colliery proprietors have been calling the attention of Government to the fact that a great part of the supply of the metallurgical works of the Charleroi basin taken out of their hands by their competitors of the Centre owing to certain disproportions existing between the transport rates charged by the State system of railways from the collieries of the Centre to the metallurgical works of the Charleroi basin, and from the collieries of this basin to the same works. The coal trade of the *Liege* district is reported to be very dull, and reductions in prices are expected. The *Turpulu* Colliery Company has declared a dividend of 8s. per share.

SPAIN.—The *Valencia Slate and Slab* Company has been formed for the purpose of purchasing the lease and extending the workings of the Valencia Quarries. The capital is to be 50,000*l.* in 5,000 shares of 10*l.* each.

ITALY.—The *Vallanzasca Gold* Mining Company have received accounts from Pallanza, which state that the machinery has been brought safely to Battigio. The great water wheel and the crusher are being put up, and all other operations connected with the construction of the new establishment are being pushed on vigorously. The appearance of the side lode discovered in the Cava Vecchia continues satisfactory.

NORTH AMERICA.

NOVA SCOTIA.—The *Nova Scotia Land and Gold Crushing and Amalgamating* Company have received glowing accounts from their managing director, which state that the report from Oldham, although brief, is highly satisfactory. The specimens sent by last mail from the Hall claims are poor compared with the ore now being raised. The lead is still very small, but it has become regular in its course and underlie, and is very rich. From Sherbrooke the agent reports that a new lode has been discovered about 4" in size. Our private advices suggest caution in accepting these reports as likely to be borne out.

LAKE SUPERIOR REGION.—Advices from *Keweenaw Point* report that mining matters there generally are prosperous. *Etna* mine is looking very well, and the quality of the vein is reported to improve in depth, and more than fulfil the expectations concerning it. At *Girard* the vein continues to look well, and is improving in width as the shaft deepens. At *Amygdaloid* good progress is being made with the stamp mill, and the mine is said to be looking better. At *Mandan, Michigan*, and *Hancock* operations are being actively carried on.

The *Marquette News and Journal* publishes some statistics on the Lake Superior iron trade, from which it appears that the first shipment of iron ore from Lake Superior to the Lower Lake ports was made in 1855, and amounted to 1,447 tons. Before that year iron mining in this region had been carried on rather as an experiment than otherwise; for although the mines were known to be rich, the means of transportation from the mines to the lake shore were quite inadequate to the demand. Since the completion of the Saut Canal and of the Bay de N. and M. R. R. to the mines the shipments have steadily increased, amounting in 1863 to 185,257 tons; the total shipments from 1855 to 1863 were 599,348 tons. These amounts are reported to fall far below the demand, especially during the last

two years, the difficulty having been to procure transport for the ores, and men to mine it.

The *Pittsburg and Boston Mining Company* have published their report for the year 1863 on the operations of their *Great Cliff* copper mine, on Keweenaw Point. This company has been paying large dividends for the last sixteen years, and its prospects are reported to be as good as ever. The amount of rough copper produced last year was 3,010,539 lbs., and the accounts show a credit balance of \$425,680. The number of men employed at these mines is 369.*

UNITED (ATLANTIC) STATES.—Coal mining is being actively carried on in the *Wyoming Valley*, and there are several shafts being sunk by a Philadelphia Company in the neighbourhood of Kingston.

An American paper reports that the excitement in oil land still continues, and indeed seems to be rather on the increase. Joint-stock companies have been formed, a considerable portion of the business has passed into their hands, and it seems probable that during the coming season, operations will be carried on more energetically than ever, and with every probability of abundant success. At the wells oil is selling at from \$6.70 per barrel, and at *Oil City* at \$7.50. The amount shipped at Pittsburg during the late rise in the river was estimated at 50,000 barrels. A new strike of oil has been made at *Tionesta* at a depth of 1,000 feet, and also one on *Benehoof Run* at a depth of 360 feet. A company has been established in New York with a capital of \$5,000,000, the object being to develop lands on *Oil Creek*.

It is stated that a Baltimore company have been making large purchases of coal lands and coal privileges in *West Virginia*, with a view to working them on a large scale. A new coal company has been incorporated, called the *Preston Coal Improvement Company*, with a capital of \$3,000,000, the object of which is to develop some lands at *Butler*, Schuylkill county, Pennsylvania.

UNITED (WESTERN) STATES.—A valuable discovery of coal has been made between Lakes Jefferson and Washington, *Minnesota*. The coal was found some 10' below the level of either of the above lakes, and if these beds prove to be as rich as present appearances indicate they will be an immense resource to the State.

CALIFORNIA AND BORDER TERRITORIES.—It is reported that the *Gould and Curry Company* are getting ore quite different in appearance from anything hitherto found in the Comstock lode. It is the colour of raw umber, containing streaks of a bright blue mineral similar to blue carbonate of copper, and is filled with bright scales of native silver. The receipt of bullion for March last was \$549,000. The *Ophir Company* are also said to have struck some valuable ore in a new winze which they are sinking, computed to be worth from \$800 to \$1,000 per ton.

Reports from *Idaho* state that the mines on Salmon river are exhausted, and little is being done at Bannock City, the mines having been deserted for those of Virginia City. On the other hand, other reports from Idaho affirm that its mineral resources are exhaustless, and that discoveries of the precious metals have been made all along the eastern slope of the Rocky Mountains.

The discovery of new and rich placer diggings is reported on the head waters of Bishop's Creek, west of *Quensville*. Reports from the *Desert* district still continue favourable, and matters at these mines are said to be looking better than for some time past.

Some good discoveries of copper, silver, and gold have, it is said, been made in *Indian Valley*. Three or four veins of silver ore have been opened upon, and two silver mining companies have been incorporated. The

scarcity of water in this region during the present season is a great drawback to mining operations.

The recent quicksilver discovery in *San Luis Obispo* county is considered to be very valuable, and is being developed by workmen from the New Almaden mine.

Reports from *Reese River* state that quantities of ore are being taken from the North Star Mine, at Upper Austin, of a quality superior even to the best ores from Gould and Curry, a portion of which is imperfectly worked at the Oregon Mill, while the tailings are carefully saved for future processes. The North Star is said to be the most thoroughly developed mine in that neighbourhood, and is open to the depth of 100'. Active operations are being carried on on the *Amador* ledge, and large quantities of silver ore are being obtained.

A large and very valuable salt mine has been discovered in *Smoky Valley*, south of Big Smoky Creek. This discovery will be of great importance to the miners of Bunker Hill and other districts lying upon the border of the valley.

Sixty tons of ore, containing silver, gold, and galena, recently arrived at San Francisco from *Santa Catalina Island*, where mining operations are being steadily prosecuted. The ore has been purchased for shipment to Swansea.

The coal deposits of the *Eldorado Canon* are attracting considerable attention, and it is expected will prove of great value in the course of another year. The ledges are large, dipping in a southerly direction, and about 40' from the surface. The coal is a brownish black colour, and brittle, and burns somewhat slowly in an ordinary stove. The gas produced from it is said to be not inferior to that taken from the best quality of Scotch coal.

SOUTH AMERICA.

GRANADA.—The *Mariquita and New Granada* Mining Company have received advices stating that the surface works were progressing very steadily, and everything about in proportion, so that it might be expected, barring accidents, that no part of the important works above or below ground would have to wait much upon the other.

BRAZIL.—The directors of the *St. John del Rey* Company have received the following report, dated Morro Velho, April:—Produce for March, 32,106 oitavas; cost for ditto, 11,276*l.*; profit for ditto, 1,426*l.* Produce for ten days of April, 8,764 oitavas; yield, 4,897 oitavas per ton.

From *Don Pedro North del Rey*, the reports state that Bawden's Mine in descending is looking well; at Branco's Mine the lode is looking well, but has not hitherto yielded much gold.

The *Anglo-Brazilian Gold* Company have received accounts from Captain Thomas Treloar, which report that matters are proceeding satisfactorily at Passagem. The produce for March amounts to 83 oitavas.

From *Santa Barbara* gold, Captain Bryant reports that no change of importance has taken place in the mine since last advices. The lode in the adit level still continues about 10 feet wide with a good appearance.

At the meeting of the *East del Rey* Mining Company held in London on May 3rd, the report of the directors stated that, after a long negotiation, they have been able to conclude the purchase of the mines and property of Morro Sao Vincento, situated in the province of Minas Gera's, and distant about 17 miles from the Emily and Capao Mines, now working by this company. The total amount required, including purchase-money and the working costs and materials for the first twelve months, would be about 26,000*l.*, which they proposed to meet by creating 25,000 additional shares

of 3*l.* each, to be offered rateably to the present proprietors on payment of 10*s.* per share. A resolution to that effect was accordingly passed.

CHILE.—The *Panulcillo Copper Company* have received advices from Panulcillo to the 13th March, when all was going on favourably, excepting the scarcity of carriage, which curtailed the supplies of coal at the furnaces, of which only five were at work.

AUSTRALASIA.

VICTORIA.—The monthly report from *Port Phillip and Colonial* shows that the yield during February was the lowest there has been since October. The quantity of quartz crushed was 3,266 tons, yielding 1,460 oz. of gold. The new stamps were working satisfactorily.

SOUTH AUSTRALIA.—The various mining companies have received advices up to March 26th. At *Kapunda* 617 tons of ore were raised in January and February. All was going on steadily, and the furnaces were in full work.

At *English and Australian* operations were progressing satisfactorily. At Port Adelaide there were six smelting furnaces, one roasting, and one refinery at work.

From *Great Northern* nothing particular is reported as to the working of the *Nuccaleena Mine*. The ground still remains very hard and troublesome for sinking.

From *Fudanamutana*, Capt. Anthony reports that at *Blinman Mine* everything was going on satisfactorily. The mine was looking well, and the furnaces were in full work.

From *Worthing*, the directors have good accounts as to *Brewer Mine*, where prospects are looking very well, the sinking under the 53 fathom level at *Legg's engine shaft*, still yielding rich yellow ore.

The reports received by the *Scottish Australian Company* state that 149 tons of ore were sampled during the month ended March 19th. At *Lambton Colliery*, the quantity of coal being sent from the pits to the port of Newcastle was from 200 to 250 tons per day.

The *Bon Accord Company* (which has very recently gone through the form of dissolving, in consequence of the Companies Act of 1862 not allowing the object of the company, which was simply and only to work the *Bon Accord property*, to be changed or extended) has been resuscitated, with enlarged powers in all respects, under the name of the *Yorke Peninsula Mining Company*. The capital is 150,000*l.*, in 1*l.* shares, of which the first issue is to be 75,000 shares, or exactly the same number of shares, of the same amount, as constituted the capital of the *Bon Accord Company*, the shareholders in which will be entitled to share for share in the new company. Such shares will, of course, be fully paid-up, and not liable to any call or liability. The objects of the *Yorke Peninsula Mining Company* are, besides taking over the *Bon Accord property*, to work the *Kurilla Copper Mine*, about five miles from the Port of Wallaroo, and to purchase and acquire, work, sell, lease, or otherwise dispose of, any other mineral property in South Australia (including the new northern territory of that colony), or any other of the Australasian colonies; to buy, sell, and smelt ores, and generally to do all and everything that may be necessary in order to develop and turn to account any property in which the company may acquire an interest.

WESTERN AUSTRALIA.—From *Fortune*, the directors have letters from Fremantle, dated March 19th, advising the purchase from the Government of the two mineral sections adjoining the company's property, at the upset price of 1*l.* per acre,—in all 169 acres.

Record of the Mining and Metal Markets.

METALLIC-ORE MARKETS.

TIN.—The standards for black tin were reduced 2*l.* on the 7th, making present quotations:—

Superior Fine	..	£103	....	Superior Common	..	£99
Second Fine	..	101	....	Second Common	..	98

A correspondent of the *West Briton* writes as follows:—"The late drops in the tin standard, are producing a great depression in tin mining. I do not anticipate any evil from the sale of the Banca tin quarterly, instead of annually. It would, perhaps, be better still if it were sold as it reached Holland, at a regular monthly sale. It is, however, a question which tin miners will now turn their attention to, whether some better method cannot be adopted to dispose of the produce of their mines than the one now in operation. If the present state of the market is caused, as some intimate, by the 'squabbles of the smelters,' the sooner we have a change, the better."

The following are the averages in the price of tin, sold from Dolcoath Mine since 1845:—

		£	s.	d.	
From 1845 to 1852, seven years..	..	46	5	0	per ton.
" 1852 to 1855, three years..	..	67	14	0	"
" 1855 to 1860, five years ..	..	75	16	0	"
" 1860 to 1863, three years..	..	69	6	0	"

Showing an average of 61*l.* 17*s.* 6*d.*, or for last eleven years of 71*l.* 16*s.*

COPPER.—At the four Cornish sales we give this month the number of tons, average produce, quantity of fine copper, average price per ton, and standard have been as follows:—

Date.	Tons.	Produce.	Fine Copper. Tons. cwt.	Price per ton.	Standard.
April 28. ...	3,472	.. 6½	215 11	£4 19 0	£123 16 0
May 5. ...	3,212	.. 6½	220 8	5 9 6	119 16 0
" 12. ...	2,580	.. 6¾	163 19	5 1 0	122 11 0
" 19. ...	5,237	.. 5¾	294 2	4 9 6	128 12 0

At the sale of the 28th the standard advanced 10*s.* according to the *West Briton*, but declined 1*l.* 16*s.* according to the *Mining Journal*. At the sale of May 5th according to the *Mining Journal* the standard was stationary, but declined 1*l.* 5*s.* according to the *West Briton*. At the sale of the 12th, the standard advanced 12*s.*, and at that of the 19th, 10*s.*

LEAD.—Lead ores have advanced considerably in price during the past month.

COAL MARKETS.

LONDON, May 28th.—From the returns of the Registrar of the London Coal Exchange, of the quantity of sea-borne coal, culm, and cinders, imported into London in the month of April, we learn that the total quantity was 239,084 tons, against 233,274 tons during the corresponding month of last year,—showing an increase of 5,810 tons.

The following are the particulars of the 239,084 tons imported during April:—

Newcastle ..	89,924	tons in 193 ships	Scotland ..	1,659	tons in 9 ships
Seaham ..	15,101	" 60 "	Wales ..	9,962	" 24 "
Sunderland ..	67,265	" 149 "	Yorkshire ..	1,044	" 11 "
Middlesbro'. ..	6,927	" 20 "	Small ..	2,890	" 7 "
Hartlepool..	42,564	" 152 "	Cinders ..	1,129	" 11 "
Blyth ..	619	" 2 "			

The quantity of coal imported by railways and canals during the month of April was 150,225 tons, against 117,098 tons in the corresponding month of last year,—showing an *increase* of 72,727 tons.

On April 3rd, the new ships arrived were 95; market dull with a reduction of 6*d.* per ton on house-coal; Hetton Wallsend, 18*s.*; South Hetton Wallsend, 18*s.*; Haswell Wallsend, 19*s.*; Tees Wallsend, 18*s.*; Braddyll's Wallsend, 17*s.* 9*d.*; Eden Main, 18*s.* 9*d.*; Bellmont Wallsend, 16*s.* 6*d.*; Haugh Hall Wallsend, 16*s.* 6*d.* On May 2nd, new ship 36; market very dull, with a further reduction of from 3*d.* to 6*d.* per ton. On the 4th, new ships 37; a fair amount of business was done in first-class house-coal, which was again reduced 6*d.* per ton. On the 6th, new ships 24; demand steady. On the 9th, new ships 23; market firm. On the 11th, new ships 10; increased firmness in the market. On the 13th, new ships 92; business steady in house-coal, Hartley's reduced 6*d.* to 9*d.* per ton. On the 16th, new ships 57; market heavy. On the 18th, new ships 46; increased heaviness in the market, with a decline of 6*d.* per ton. On the 20th, new ships 26; business dull. On the 23rd, new ships 75; market heavy, with a further reduction of 6*d.* per ton. On the 25th, being the Derby day, the market was closed. On the 27th, new ships 126; a large business was done at a reduction of 6*d.* per ton in house-coal, and 3*d.* per ton in Hartley's. Hetton Wallsend, 16*s.* 6*d.*; South Hetton Wallsend, 16*s.* 6*d.*; Lambton Wallsend, 16*s.*; Braddyll's Wallsend, 15*s.*; Eden Main, 14*s.* 6*d.*; Harton Wallsend, 14*s.*; Gosforth Wallsend, 14*s.*; Riddell's Wallsend, 14*s.*; Framwellgate Wallsend, 13*s.* 9*d.*; Hasting's Hartley, 13*s.* 3*d.*; Tanfield Moor, 14*s.*

LIVERPOOL.—From Messrs. J. and T. Platt's Coal Circular we find that the quantity of coal, cannel, coke, and patent fuel shipped from Liverpool to foreign and colonial ports during the month of April was 47,100 tons, against 49,940 tons during the corresponding month of last year—showing a *decrease* of 2,832 tons. The exports coastwise during April were 12,347 tons, against 6,353 tons during the same month last year—showing an *increase* of 6,194 tons. The total exports coastwise from January to April were 41,229 tons, against 26,122 tons during the corresponding period of 1863—showing an *increase* of 15,107 tons.

CONTRACTS FOR COAL.—The Admiralty require the supply of 500 tons of South Wales to be delivered at Ascension; the Royal Spanish Naval Commission require the supply of 6,000 tons of Welsh coal for St. Jago de Cuba, and 6,000 tons for Havana; and the Portsea Island Gas Light Company require 16,000 tons of gas coal.

SHARE MARKETS.

LONDON, May 28th.—The London share market has been very quiet all through the month, business having been much interfered with by the Whitsun holidays and the Derby week, and the market closes dull, prices in a great number of instances being merely nominal.

At a meeting.

Wheal Seton	£25	West Frances	£1
East Lovell	1	Wheal Basset	2½
Herodfoot	3	Cliford Amalgamated	2½
Mary Ann	3½	Great Laxey	7½
East Grenville	1		

Declined.

West Seton	£30	Wheal Grenville	£1½
North Roskear	4	South Frances	5
Great Wheal Vor	1	Wheal Buller	4
Basset and Grylls	3	Wheal Rose	10
Wheal Margaret	4½	Nanjiles	3½
Providence	2	New Rosewarne	slightly
Great Wheal Fortune	1	Pendeen	1½
East Caradon	1½	Stray Park	4
West Caradon	4	Cook's Kitchen	2
West Chiverton	5	Bryn Gwiog	2
Wheal Chiverton	1½	Rhymney Iron	2½
Cargoll	5½	St. John Del Rey	1½
Wheal Trelawny	1½	Anglo-Mexican Mint	1
Mineral Bottom	1		

A good business has been transacted in *Wheal Seton* shares which at one time advanced 32*l.* per share. They opened at 197½*l.*-202½*l.* and rose steadily up to the 19th, when they were 225*l.*-235*l.*; since that date they have receded, and close at 222½*l.*-227½*l.* *West Seton* shares have again receded, and are now quoted at 170*l.*-180*l.* *North Roskear* shares, which were quoted last month at 24*l.*-26*l.*, have gone back to 20*l.*-22*l.* *North Crofty*, 4½*l.*-4½*l.* *Wheal Agar*, 3½*l.*-3½*l.*

There has again been a slight advance in *East Lovell* shares, which opened on the 29th at 20*l.*-21*l.*, and at one time went up to 22*l.*-23*l.*, but receded again and close at 20*l.*-21*l.* *Great Wheal Vor* shares opened on the 29th, at an advance of 1½*l.*, which, however, they failed to maintain, but again declined and were quoted during the early part of the month as low as 30½*l.*-31½*l.* They close better at 33*l.*-33½*l.* *Wheal Basset and Grylls* shares have declined to 11*l.*-13*l.* *Wheal Margaret* shares have been quoted all through the month at 14*l.*-15*l.*, which is a decline of 4½*l.* upon our last prices. *Providence* shares have receded from 41*l.*-43*l.* to 39*l.*-41*l.* There has been little fluctuation in *Great Wheal Fortune* shares, which close slightly lower at 14*l.*-15*l.* *Wheal Grylls*, 25*l.*-27*l.* *Calvadnack*, 7*l.*-8*l.* *East Grylls*, 12½*l.*-13½*l.* *Wheal Margery*, 6½*l.*-7½*l.* *St Ives Consols*, 25*l.*-27½*l.* *Great Grylls*, 4*l.*-4½*l.* *Grylls Wheal Florence*, 3*l.*-3½*l.* *Sithney Carnmeal*, 6½*l.*-6½*l.* *Sithney Wheal Metal*, 3*l.*-3½*l.* *West Wheal Metal*, 3½*l.*-4½*l.* *East Wheal Vor*, 5½*l.*-5½*l.* *East Great Grylls*, 12*l.*-13*l.*

A fair amount of business has been transacted in *East Caradon* shares. They opened on the 29th at 30*l.*-30½*l.*, and after but little fluctuation close at their lowest price of the month of 28½*l.*-29*l.* *West Caradon* shares have declined from 20*l.*-21*l.* to 16*l.*-17*l.* *Glasgow Caradon*, 3½*l.*-4*l.* *South Caradon*, 455*l.*-465*l.* *South Caradon Wheal Hooper*, 4*s.*-6*s.* *Caradon Vale*, 3*l.*-3½*l.* *Marke Valley*, 4½*l.*-5*l.* *Gonamena*, 3½*l.*-4*l.*

West Chiverton shares are called 5*l.* lower than at the close of last month. Their first quotation on the 29th was 75*l.*-80*l.*; on the 14th, 70*l.*-75*l.* On the 17th, 72½*l.*-77½*l.*; and at the end of the month again 70*l.*-75*l.* *Wheal Chiverton* shares have declined to 10½*l.*-11½*l.* *Herodsfoot* shares have shown more firmness, and have advanced from their opening quotation of 36*l.*-38*l.* to 39*l.*-41*l.*, at which they close. An improvement has taken place in *Wheal Mary Ann* shares. They opened on the 29th, at 11½*l.*-12½*l.*; on the 9th, they were 12½*l.*-13½*l.*, but declined again on the 10th to their opening price. On the 18th, they again improved, and have done so steadily ever since, closing at 15*l.*-16*l.* *Cargoll* shares have declined to 30*l.*-32*l.* *Wheal Trelawny* shares have also declined to 22*l.*-22½*l.* *Wheal Ludcott and Wrey*, 1½*l.*-2*l.* *Mineral Bottom*, 6*l.*-6½*l.* *Wheal Hope*, 4*l.*-4½*l.* *North Shepherds*, 4½*l.*-5½*l.* *Chiverton Moor*, 4½*l.*-5*l.* *North Chiverton*, 2½*l.*-2½*l.* *Chiverton Valley*, 4½*l.*-5*l.* *Wentworth Consols*, 16*l.*-17*l.* *Great South Chiverton*, 2½*l.*-2½*l.*

Wheal Grenville shares have been rather flat. They opened at 9½*l.*-10½*l.*,

and leave off at 8*l.*-8½*l.* *East Grenville* shares have been better at 4½*l.*-4¾*l.* *West Frances* shares have not been reported in the market since February, when they were called 25*l.*-26*l.*, until the middle of this month, when they were quoted at 28*l.*-30*l.* On the 21st, they improved to 30*l.*-35*l.*, but close lower at 30*l.*-31*l.* *South Frances* shares receded at one time to 37½*l.*-42½*l.*, but leave off better at 42½*l.*-45*l.* A slight improvement has taken place in *Wheal Basset* shares, which are now quoted at 90*l.*-92½*l.* *East Basset*, 65*l.*-67*l.* *Wheal Buller* shares have declined from 32*l.*-34*l.* to 27½*l.*-30*l.*

There has been a considerable fall in *Wheal Rose* shares. Prices opened at 52*l.*-54*l.*, being an advance of 2*l.* on our last quotation. After that, however, they began to decline, at one time receding to 43*l.*-45*l.*, and close at 44*l.*-46*l.* *Clifford Amalgamated* shares, which opened on the 30th at 31½*l.*-32½*l.*, close better at 33½*l.*-34½*l.* *Nanjiles* shares have not maintained last month's closing prices, having gone back to 29½*l.*-30½*l.* *Great Wheal Busy*, 3½*l.*-3¾*l.* *Hallenbeagle*, 3¾*l.*-4*l.* *Great North Downs*, 5½*l.*-5¾*l.* *St. Day United*, 33*l.*-35*l.* *Grambler and St. Aubyn*, 10*l.*-12*l.*

Prosper United shares have been very dull at 5½*l.*-5¾*l.* *New Rosewarne* shares have been weak, and close at 10½*l.*-11½*l.* *Pendeen* shares have gone back from 6*l.*-6½*l.* to 4½*l.*-5*l.* *Wheal Unity*, 4*l.*-6*l.* *Wheal Kitty* (*St. Agnes*), 6½*l.*-6¾*l.* *East Rosewarne*, 3*l.*-3½*l.* *Treloweth*, 1½*l.*-2*l.*

Stray Park shares have declined to 27*l.*-29*l.* *Cook's Kitchen* shares have also declined to 18*l.*-19*l.* *Carn Camborne*, 1½*l.*-1¾*l.* *Tincroft*, 18½*l.*-18¾*l.* *Wheal Harriett*, 1½*l.*-1¾*l.* *Camborne Vean*, 2½*l.*-3*l.* *South Condurrow*, 17*l.* 6*d.*-22*l.* 6*d.*

East Russell, 3¾*l.*-4*l.* *Drakewalls*, 1½*l.*-1¾*l.* *Wheal Crebor*, 43*l.*-46*l.* *North Robert*, 4*l.*-5*l.* *New Martha*, 1½*l.*-1¾*l.* *Hingston Down*, 3½*l.*-3¾*l.* *Wheal Edward*, 1½*l.*-1¾*l.* *Bottle Hill*, 4*l.*-6*l.*

East Carn Brea, 7*l.*-7½*l.* *Wheal Ury*, 5½*l.*-6*l.* *South Carn Brea*, 15*l.*-20*l.* *South Tolgus*, 38*l.*-40*l.* *Great South Tolgus*, 3*l.*-3½*l.* *North Treskerby*, 2½*l.*-3½*l.*

Among Welsh mines the following may be mentioned:—*Great Larey* shares have considerably advanced, they now stand at 14*l.*-15*l.* *Bryn Giriog* shares are quoted at 29*l.*-30*l.*, being a reduction of 2*l.* upon our last prices. *Rhymney Iron* shares have declined to 27*l.* *Rhymney Iron New*, 8*l.* *Bryntail*, 2½*l.*-3*l.*

Among foreign and colonial mines transactions have been reported as follows:—*St. John Del Rey* shares have almost lost last month's advance and have receded to 46½*l.* *Cape Copper* shares are about the same as last month; their closing quotation is 11¾. *Anglo-Mexican Mint* shares are lower at 20½*l.* *Bon Accord*, 5*l.*-7*l.* 6*d.* *Brazilian Land and Mining*, 11¾*l.*-11½*l.* *Anglo-Brazilian Gold*, 12*l.* 6*d.* *General*, 21¾*l.* *Nora Scotia Gold and Lind*, 2½*l.*-3*l.* *Muriquita*, 10*l.* *Quebrada Land and Mining*, 3½*l.* *Vancouver Coal*, 6*l.* *Alamillos*, 1*l.* *Scottish Australian*, 10*l.*-12*l.* 6*d.* *Montes Aureos*, 2½*l.* *Cobre Copper*, 34½*l.* *Pontgibaud*, 7½*l.* *Kapunda*, 1½*l.* *East Del Rey*, 12*l.* 6*d.*-15*l.* *Copiapó*, 5½*l.*-6*l.* *Port Phillip*, 1½*l.*-1¾*l.* *Santa Barbara*, 10*l.* *Don Pedro North Del Rey*, 10*l.*-12*l.* 6*d.* *Worthing*, 17*l.* 6*d.* *United Mexican*, 5½*l.*-6½*l.* *x. d.* *Fortuna*, 3½*l.* *Yudunamutana*, 3½*l.* *English and Australian Copper*, 1½*l.*

Among new undertakings, *New Wheal Seton* shares have been quoted at 80*l.*-85*l.* *Great East Lovell*, 3½*l.*-4½*l.*

CORNWALL—A moderate amount of business has on the whole been done in the Cornish mining share market, and some shares have been largely dealt in. *Wheal Seton* shares have advanced, and close at 225*l.* *Wheal Margaret* shares have dropped to 13*l.*-14*l.* *Great Wheal Vor* shares quiet at 33*l.*-33½*l.* *East Lovell*, 19*l.*-20*l.* *Wheal Rose*, 45*l.*-46*l.* *Wheal Grenville*, 9*l.*-9½*l.* *East Grenville*, 4½*l.*-4¾*l.* *East Caradon*, 29*l.*-30*l.*

BIRMINGHAM.—*Muntz's Metal* shares, 10*l.*-20*l.* *dis.*

MANCHESTER.—The mining market here has been quiet. *East Caradon* shares have gone back. *Clifford Amalgamated* shares have been inquired for, as have also shares in *Baldwin Lead* mine. *Wheal Uny*, 7*l*.

LIVERPOOL.—*Copiapo and Caldera*, 146*l*.

NEWCASTLE-ON-TYNE.—There was a moderate amount of activity in the mining share market during the early part of the month, which has not since been maintained. Business has been done chiefly in *East Lovell*, *Wentworth*, *West Chiverton* and *Great Wheal Vor* shares. *Troed-y-rhiw* shares have been offered at 4*s*.-5*s*.

DUBLIN.—The Irish share market has been characterised by great dulness during the past month, *Mining Company of Ireland* shares being about the only ones that have advanced. They leave off at 23*l*., at which price they were in great request. *Wicklow Copper* shares weak at 11*½l*. *Connorree*, 16*s*. 6*d*. *Carysfort*, 15*s*.

SAN FRANCISCO. *April 8th.*—The Mining share market has been rather quiet during the past month, the only feature of special interest having been the fluctuation in *Real del Monte*, in which mine an enormous number of shares have changed hands. In consequence of the announcement of a large shipment of bullion, and of important improvements in the new workings of the mine, stock rapidly advanced from \$36 to \$130, with large sales at intermediate rates. Prices, however, quickly declined to \$93, and close at \$78 with a downward tendency. *Wide West* shares have also been largely in demand. *Ophir* shares have declined in price, and, in consequence of unusually heavy expenses, the directors have been obliged to suspend the dividends for March. Quotations close at \$1,580-\$1,590. *Gould and Curry* shares have been quiet at \$4,500. A dividend of \$125 per foot has been declared. *Lady Bryan* shares have been considerably dealt in at \$45-\$54. *Chollar* shares have been quiet and have declined to \$320. *North American* shares still continue an important feature in the market; prices close at \$139. *Savage* shares have been very quiet at \$2,580-\$2,610. A dividend of \$50 per foot has been declared. *Uncle Sam* shares have been in better demand and prices have advanced to \$1,000-\$1,050. *Burning Moscow* shares have been quiet at \$96-\$98. *North Potosi* shares have declined to \$40. *Baltic*, \$140. *Melones*, \$45. *Central American*, \$12. *Pride of the West*, \$93. *Buckeye*, \$15. *Lafayette*, \$10. *Crockett*, \$8-\$12. *Justice*, \$140. *Yellow Jacket*, \$1,200. *Imperial*, \$180.

METAL MARKETS.

LONDON. *May 28th.*—The dulness in the metal market noticed in our last continued during all the early part of the month, but towards the end the reduction of the Bank rate of discount caused prospects to brighten a little, and although there has not been an active demand it is believed that prices have seen their lowest for the present.

IRON.—The market for this metal has been inactive, with little business doing. Scotch pig opened at 59*s*. 6*d*., and after receding to 58*s*. 3*d*. closes at 59*s*. 7½*d*. cash, 61*s*. 3*d*. open. Welsh bars have been dull of sale, but rails have been firm and in good demand. Staffordshire descriptions show no alteration.

COPPER.—Towards the end of the month the market for copper became a little more active in consequence of the smelters having accepted large contracts for India at 100*l*., being 5*l*. per ton below official rates. After that the market became firmer, and 103*l*. was about the price for manufactured. *Burra*, 100*l*.

TIN.—The smelters reduced the price of English 4*l.* per ton, but the market has continued depressed, and at the end of the month the metal could be obtained at 3*l.* under official rates. Foreign has been in more demand, and 106*l.* has been asked for Straits; 108*l.* three months. Banca 111*l.* The Dutch market nominal at 67 *fl.*

TIN PLATES have been in moderate demand.

LEAD has been firm and in fair demand.

SPELTER.—A large business has been done in this article at advancing prices. On the spot 22*l.* 5*s.*; for August delivery 22*l.* 10*s.*

GLASGOW, May 28th. **IRON.**—There has only been a moderate amount of activity in the Scotch pig-iron market. Prices opened at the beginning of the month at 59*s.*, buyers; 59*s.* 3*d.*, sellers; No. 1 Gartsherrie 63*s.* 6*d.*; Coltness, 63*s.*; Glengarnock, 60*s.* The market continued depressed until the 5th, when it opened firm as 59*s.* cash, but, before the end of the day, declined to 58*s.* 3*d.*, on account of the advance in the Bank rate. On the 7th, the market was again firm, and remained so until the 12th; it then became more quiet, but still steady for two or three days. Since that date the market has fluctuated but little, and closes pretty steady at 59*s.* 9*d.* cash. No. 1, G.M.B., 59*s.*; No. 3, 58*s.* 3*d.*

PARIS, May 26th.—**COPPER.**—Scarcely any business has been done in this article, and prices remain unaltered. English, 247½ *fr.* Lake Superior, 305 *fr.* Chili, 230 *fr.*

TIN also remains unaltered.

SPELTER has been firm at 58 *fr.*

COLOGNE, May 23rd.—The tone of the metal market has improved during the past month. **COPPER, LEAD, and ZINC** have been in better demand at higher prices. **TIN** has been quiet.

AMSTERDAM, May 21st. **COPPER** remains unaltered.

TIN.—Banca has been somewhat firmer at 67 *fl.*

HAMBURG, May 20th.—No business of any importance has been transacted in the metal market here during the past month.

IRON.—Scotch pig 2½ *mk.* English in bars 6½ to 6¾ *mk.* Staffordshire descriptions 7½ to 7¾ *mk.* Swedish, 8¾ *mk.*

COPPER remains unaltered and very little business has been transacted.

TIN has been neglected and prices are merely nominal. Banca, 12¾ *sch.* English 12¼ *sch.*

SPELTER.—A large business has been done in this article at advanced prices.

BRESLAU, May 21st.—**SPELTER.**—This article has been in great demand and several thousand centners have changed hands during the last fortnight at from 6 *thlrs.* 20 *sgr.* to 6 *thlr.* 26 *sgr.* The greater portion of the June production is already purchased, and if the demand continues, still better prices may be expected.

BERLIN, May 21st.—During the past month, the holidays have as usual had an unfavourable effect upon the metal market, so that there are few alterations to notice.

IRON.—Scotch pig, 52½ *sgr.*

COPPER has been very quiet. English, 32 *thlrs.* Demidoff, 37 *thlrs.* Paschkoff, 42 *thlrs.*

No business has been done in **TIN**, and prices are nominal.

SPELTER.—A large business was done in this article, which is bought up as soon as it comes into the market. Ordinary brands 6½ *thlrs.*

HONGKONG, April 15th.—**METALS.**—Trifling sales; quotations unaltered.

AMOY, April, 9th.—**LEAD.**—Sold 867 pigs at \$7.25 to \$7.50 per *p.cul.*

Furnished by Von Dadelszen and North, 158, Leadenhall Street, London, E.C.

During the early part of the month the metal market, owing to the rise in the rate of discount, and the uncertain state of politics, was in a very depressed state, but since the 20th instant, the Bank having reduced the rate $2\frac{1}{2}\%$, the market has shown more activity.

IRON.—There has been no alteration in Welsh bars. Rails have been in fair demand. Staffordshire iron, although the American demand has fallen off, in other parts is fully up to the average. Scotch pig iron opened at 58s. 6d. cash and 60s. three months, and advanced to 60s. cash and 61s. 6d. three months, but again receded to 59s. cash. We quote present prices 59s. 9d. cash and 61s. 6d. open.

COPPER.—This article was very flat until the 25th instant when the smelters accepted some large contracts at 100*l.*; now 103*l.* is the nearest price for manufactured. Second-hand parcels of English were obtainable considerably below smelters' prices. Burra has been sold at 100*l.* Other makes of foreign quite nominal.

TIN opened very flat, with Straits selling at 106*l.* two months prompt and 105*l.* cash, 109*l.* has since been paid three months prompt. English 3*l.* below fixed prices. Banca 111*l.* The Dutch market nominal 67*fl.*

TIN PLATES have been in fair demand.

LEAD firm and in fair demand.

SPELTER.—A good business has been done in this article and prices are dearer, 23*l.* paid on the spot, and 23*l.* 5*s.* for July. Hull Spelter has been sold at 22*l.* 10*s.*

THE BOARD OF TRADE RETURNS.

The "Accounts relating to Trade and Navigation of the United Kingdom, for the month ended 31st March, 1864, and three months ended 31st March, 1864," have been issued by the Statistical Department, Board of Trade.

IMPORTS.—The quantities and relative increase and decrease of the imports of metals, metallic ores, and mineral products, for the month and three months ended 31st March, have been as follows:—

	Month ended 31st March.			Three Months ended 31st March.		
	1863.	1864.	Increase (+) or Decrease (—)	1863.	1864.	Increase (+) or Decrease (—).
Brimstone cwt.	126,000	72,302	— 53,698	243,538	126,256	— 117,282
Copper Ore tons	6,865	3,829	— 3,036	15,661	14,188	— 1,473
Copper Regulus "	1,319	2,879	+ 1,560	5,631	5,088	— 543
Copper, unwrought and part wrought cwt.	28,220	40,300	+ 12,080	48,700	90,200	+ 41,500
Iron, in Bars, unwrought, tons	880	821	— 59	2,035	4,798	+ 2,763
Steel, unwrought "	191	687	+ 496	292	1,306	+ 1,014
Lead, Pig and Sheet "	3,135	3,725	+ 590	5,740	7,876	+ 2,136
Spelter or Zinc "	1,587	3,782	+ 2,195	3,478	7,903	+ 4,525
Tin, in Blocks, Ingots, Bars, or Slabs cwt.	3,212	5,712	+ 2,500	6,330	7,351	+ 1,021
Silver Ore value in £	31,100	19,536	— 11,564	57,740	58,606	+ 866
Petroleum tons	3,433	1,284	— 2,149	4,760	4,092	— 668
Pyrites tons	17,269	7,704	— 9,565	29,286	16,979	— 12,307
Quicksilver lbs.	79,157	547,004	+ 467,847	245,328	1,000,039	+ 754,711

EXPORTS.—The quantities, declared value, and relative increase and decrease of the exports of metals, minerals, and metallurgical articles of British and Irish produce and manufactures, for the month and three months ended 31st March, have been as follows:—

QUANTITIES.				DECLARED VALUE.			
Month ended 31st March.		Three Months ended 31st March.		Month ended 31st March.		Three Months ended 31st March.	
1863.	1864.	1863.	1864.	1863.	1864.	1863.	1864.
186,320	196,387	475,826	488,437	771,130	80,477	198,283	200,891
706,454	713,233	1,680,763	1,889,678	311,224	335,321	795,536	903,023
39,905	33,953	93,959	82,925	110,970	105,354	258,631	256,639
26,728	29,629	71,802	71,808	196,314	279,201	528,016	555,486
31,639	34,075	84,208	95,985	223,496	275,073	596,206	755,084
8,322	6,028	19,464	13,096	74,331	56,453	166,831	128,952
10,998	11,132	26,102	28,947	177,809	155,700	287,088	406,313
6,345	8,927	20,283	21,115	126,419	175,288	396,895	437,544
2,695	790	2,232	2,232	9,780	3,191	5,364	9,582
2,359	3,266	6,562	8,181	65,264	100,997	186,468	257,246
29,731	7,499	44,867	21,457	136,690	40,693	268,135	113,697
50,897	28,976	105,035	100,419	230,547	154,322	482,263	526,779
1,075	900	2,442	1,815	6,704	5,579	14,604	12,040
3,554	3,163	8,638	7,880	17,643	18,614	44,608	44,231
4,692	3,912	8,731	9,132	102,898	84,899	191,065	198,428
510	550	1,210	1,350	12,616	13,991	28,737	34,255
5,818	7,859	15,724	21,950	34,191	45,614	91,068	122,910
93,537	126,832	239,441	256,101	110,187	161,793	279,602	321,698
8,336	13,143	19,725	29,358	8,130	14,764	19,909	31,711
60,670	41,960	115,398	100,191	25,791	19,593	51,832	48,011
				1,999,967	2,126,661	4,809,161	5,464,450

LONDON PRICES CURRENT OF METALS.

From Messrs. JAMES and SHAKESPEARE'S, 10, Austin Friars, E.C., 28th May.

		Per Ton.	
IRON	{ Rails	£7 0 0	@ £7 5 0
Welch	{ Bars	7 5 0	" 7 10 0
	{ "	8 5 0	" 9 0 0
	{ "	10 0 0	" 10 10 0
Staffordshire	{ Nail Rods	10 0 0	" 10 10 0
	{ Hoops	11 0 0	" 11 10 0
	{ Sheets	12 0 0	" 12 10 0
Scotch	Pig (mixed Nos. warrants) in the Clyde	—	" 2 19 9
Swedish	{ Iron { Large sizes	12 10 0	" 12 15 0
Hammered	{ Indian assortments ..	12 10 0	" 13 0 0
	{ Steel { Faggot	16 10 0	" 17 10 0
	{ In kegs ($\frac{1}{4}$ and $\frac{3}{8}$ in.) ..	15 10 0	" 16 0 0
		Per Unit.	
COPPER	Ore	—	@ 17s. 0d.
	Regulus	—	" 17s. 0d.
	Barilla	—	" 18s. 6d.
		Per Ton.	
	Chili Slab (for 96% pure Copper)	—	none —
	Spanish Cake	£92 0 0	@ £94 0 0
Australian ..	{ Burra and P.C.C.	—	" 100 0 0
	{ Kapunda	—	" 100 0 0
	{ Wallaroo	—	" 100 0 0
American....	{ Baltimore	—	none —
	{ Lake Superior	—	—
	{ Tough Cake and Ingot and Tile ..	—	@ 98 0 0
English	{ Best selected Ingot	—	" 101 0 0
	{ Sheets, Sheathing and Rod	—	" 105 0 0
	{ Flat Bottoms	—	" 110 0 0
		Per lb.	
YELLOW METAL..	Sheets	8d.	@ 8½d.
	Sheathing and Rod	8½d.	" 9d.
		Per Cwt.	
TIN	{ Common Blocks and Ingots	—	@ 108s.
English ..	{ " Bars (in barrels)	—	" 109s.
	{ Refined	—	" 113s.
	{ Straits, Fine	105s. 6d.	" 106s.
Foreign ..	{ " (with 3 months' prompt) ..	—	" 108s.
	{ Banca	110s.	" 112s.
		Per Box.	
TIN PLATES	Charcoal IC, best	3Cs. 0d.	@ 31s. 0d.
	" IX "	36s. 0d.	" 37s. 0d.
	Coke IC	24s. 0d.	" 26s. 0d.
	" IX	30s. 0d.	" 32s. 0d.
		Per Ton.	
LEAD.....	{ Sheet	£21 17 6	@ £22 0 0
English ..	{ Pig—W.B.	—	" 23 0 0
	{ " Other good brands	21 15 0	" 22 0 0
Foreign ..	{ German and Spanish, soft ..	—	" 21 0 0
	{ Red	—	" 23 0 0
English ..	{ Shot	—	" 24 0 0
	{ Dry White	—	" 26 10 0
SPELTER	(Silesian) in Cakes	—	" 22 10 0
ZINC	(Sheet) No. 9 and upwards	—	" 25 0 0
		Per Bottle.	
QUICKSILVER (in bottles containing 75lbs. each)		8 15 0	@ 9 0 0
		Per Ton.	
REGULUS OF ANTIMONY, French Star		26 0 0	@ 37 0 0

Tabular Abstract of Mining Accounts for the Month.

Date of Account.	Name of Mine, and Number of Shares.	Balances.		Calls.		Dividends.	
		Debit.	Credit.	Per Share.	Total.	Per Share.	Total.
		£ s. d.	£ s. d.	£ s. d.	£ s. d.	£ s. d.	£ s. d.
CORNISH & DEVON MINES.							
April 20	Wheal Margery (968)	58 6 4	—	—	—	—	—
" 23	Mauldin (6,000)	590 4 4	—	0 2 0	600 0 0	—	—
" 25	East Pool (128)	—	1,048 13 0	—	—	7 10 0	960 0 0
" 25	Wheal Trannack (960)	53 4 5	—	0 2 6	120 0 0	—	—
" 25	Pendree Consols (5,000)	—	42 18 0	—	—	—	—
" 25	Chiverton (3,000)	—	700 0 0	—	—	—	—
" 25	New Seton (400)	322 14 5	—	2 10 0	1,000 0 0	—	—
" 25	Wheal Rose (2,000)	719 18 11	—	—	—	—	—
" 25	Lady Bertha (6,000)	591 7 2	—	0 2 0	600 0 0	—	—
" 25	Hingston Down (6,000)	—	199 1 6	—	—	—	—
" 30	Kitty (St. Agnes) (4,295)	—	1,721 0 0	—	—	0 5 0	1,073 15 0
" 30	Wendron Consols (1,024)	—	—	—	—	1 10 0	1,536 0 0
" 30	South Carn Brea (6,000)	—	—	0 1 6	450 0 0	—	—
May 2	South Frances (496)	—	1,112 1 9	—	—	—	—
" 3	West Chiverton (3,000)	—	—	—	—	0 15 0	2,250 0 0
" 3	Bedmoor (10,156)	246 5 0	—	0 1 0	207 16 0	—	—
" 3	Wheal Jane (512)	—	408 12 1	—	—	0 10 0	256 0 0
" 5	South Caradon Wheal Hooper (4,096)	311 0 0	—	0 2 0	409 12 0	—	—
" 6	East Devon Great Consols (4,000)	80 19 11	—	0 2 0	400 0 0	—	—
" 9	East Margaret (1,024)	761 19 3	—	0 10 0	512 0 0	—	—
" 9	West Frances (512)	946 5 11	—	2 0 0	1,024 0 0	—	—
" 10	Grambler & St. Aubyn (496)	252 9 0	—	1 0 0	486 0 0	—	—
" 10	Roskearnoweth (700)	—	93 7 0	—	—	—	—
" 10	North Roskear (700)	2,230 11 10	—	2 0 0	1,400 0 0	—	—
" 10	Buscawen (6,000)	393 1 5	—	—	—	—	—
" 10	Great North Downs (5,000)	1,624 0 0	—	0 7 0	1,750 0 0	—	—
" 10	East Grenville (6,000)	1,320 5 6	—	0 4 0	1,200 0 0	—	—
" 10	Great Brigan (5,000)	1,457 0 0	—	0 6 0	1,500 0 0	—	—
" 10	Great Busy (5,000)	—	880 12 4	—	—	—	—
" 10	New Pembroke (6,400)	—	—	0 2 6	800 0 0	—	—
" 11	Devon Great Consols (1,024)	—	36,529 7 8	—	—	12 0 0	12,288 0 0
" 12	Wheal Trelawny (1,024)	—	660 12 6	—	—	0 12 6	650 0 0
" 16	Emily Henrietta (1,024)	—	177 17 3	0 5 0	256 0 0	—	—
" 16	Frank Mills (500)	—	2,477 7 7	—	—	0 4 0	1,000 0 0
" 16	South Exmouth (5,000)	2,050 3 5	—	0 5 0	1,250 0 0	—	—
" 16	West Damsel (250)	—	660 0 0	—	—	1 10 0	384 0 0
" 17	St. Ives Consols (940)	—	711 0 0	—	—	0 10 0	470 0 0
" 17	North Phoenix (4,000)	—	310 4 1	0 2 6	500 0 0	—	—
" 17	Wheal Buller 256	15 2 5	—	2 0 0	512 0 0	—	—
" 18	Ludecott and Wrey (4,500)	91 16 8	—	0 4 0	960 0 0	—	—
" 18	Wheal Sparrow (6,000)	434 2 5	—	0 10 0	3,000 0 0	—	—
" 18	Polhigey Moor (6,000)	435 18 1	—	0 3 0	900 0 0	—	—
" 18	Wheal Curtis (1,000)	—	—	1 10 0	1,500 0 0	—	—
" 18	Wheal Crebor (6,000)	—	195 17 7	0 1 6	450 0 0	—	—
" 19	Sithney Carnmeal (2,040)	1,935 15 4	—	1 0 0	2,048 0 0	—	—
" 19	Wheal Par (1,024)	401 16 4	—	0 8 0	409 12 0	—	—
" 19	Nanfles (1,024)	—	—	1 10 0	1,536 0 0	—	—
" 20	Wheal Owles (80)	—	2,088 18 4	—	—	5 0 0	400 0 0
" 20	St Ives Wheal Allen (1,024)	572 9 5	—	0 11 0	563 4 0	3 0 0	600 0 0
" 20	Botallack (200)	—	—	—	—	—	—
" 23	Wheal Tiernayne (2,044)	—	517 3 1	—	—	—	—
WELSH & OTHER MINES.							
May 10	South Kilmorey (96)	—	41 19 0	—	—	—	—
" 10	South Pant-y-Gof (96)	—	24 18 8	1 0 0	96 0 0	—	—
" 10	Lady Eleanor (?)	—	144 3 7	1 0 0	?	—	—
" 21	Wicklow Copper (7,000)	—	5,284 18 4	—	—	0 6 0	2,100 0 0
" 21	Great Darren ()	2,327 0 0	—	12 0 0	—	—	—
FOREIGN MINES.							
April 28	Central American (6,000)	—	7,600 0 0	—	—	—	—
May 4	United Mexican (43,174)	—	—	—	—	0 5 0	10,793 100

Copper Pres.

Sampled April 13, and sold at Tabb's Hotel, Redruth, April 28.

Mines.	Tons.	Pur- chasers.	Price.	Mines.	Tons.	Pur- chasers.	Price.
Great Wheal Busy ...	109	12	£2 16 6	Clifford Amalgamated	45	1	£7 12 6
	108	12	2 8 0		18	5	2 6 6
	82	7	3 1 0		17	5	4 3 0
	67	9	4 1 6	Tywarnhaile	66	7, 12	2 2 6
	50	1	1 11 6		65	6	2 2 0
	40	1	3 3 6		64	7	2 5 0
	15	9	5 8 6		60	12	2 2 6
South Caradon	86	9	5 14 0		56	2	2 9 0
	76	4, 6	9 5 6		44	2, 6	7 4 6
	75	7	5 19 6		40	3, 6	7 9 6
	72	1	6 7 6	Fowey Consols	91	1, 6	6 3 6
	59	1, 2	16 6 6		83	1, 6	6 1 6
	57	5	19 8 0		81	1	6 18 6
	42	1	6 2 6		65	9	4 4 0
Phoenix Mines	95	8	3 3 6	Craddock Moor	72	10	5 14 6
	81	8	3 0 6		58	1, 2, 3	9 5 6
	77	1	2 14 6		35	13	5 10 6
	71	10	2 12 0		29	1, 10	3 6 6
	46	1	3 15 0	Great North Downs ...	69	3	4 16 6
	45	6	10 3 6		61	7	4 14 0
	28	1	6 8 6	Boscawen.....	69	3, 9	3 5 0
West Damsel	82	3	4 11 6		31	3	9 16 6
	80	7	4 6 0	East Wheal Ellen	52	1, 5, 6	4 13 6
	79	6	4 4 6	Falmouth and Sperries.....	32	1, 5	2 6 6
	71	3	4 6 6	North Grambler.....	22	2	5 9 6
	63	3	4 4 6	Buckingham's Ore.....	16	1	3 15 6
	35	3	3 16 6		1	5	16 2 0
Clifford Amalgamated	76	5	2 0 6	Grambler & St. Aubyn ..	11	2	6 7 0
	75	5	2 5 0	Carbis's Precipitate ...	2	5	45 8 6
	65	6	6 8 6	Symons's Precipitate...	1	5	24 7 6
	57	2	3 3 0	Niness's Precipitate ...	1	5	43 0 6
	51	5	2 3 0				

TOTAL PRODUCE AND VALUE.

	Tons.	Amount.		Tons.	Amount.
Great Wheal Busy	471	£1,377 7 6	Boscawen	100	£528 16 6
South Caradon	467	4,428 9 0	East Wheal Ellen	52	243 2 0
Phoenix Mines	443	1,751 7 0	Falmouth and Sperries.....	32	74 8 0
West Damsel	410	1,760 1 0	North Grambler.....	22	120 9 0
Clifford Amalgamated	404	1,485 0 0	Buckingham's Ore.....	17	76 10 0
Tywarnhaile	395	1,302 7 0	Grambler and St. Aubyn ...	11	69 17 0
Fowey Consols	320	1,900 1 6	Carbis's Precipitate	2	90 17 0
Craddock Moor	194	1,239 19 0	Symons's Precipitate	1	24 7 6
Great North Downs	130	619 12 6	Niness's Precipitate	1	43 0 6

EACH COMPANY'S PURCHASE.

	Tons.	Amount.		Tons.	Amount.
1 Vivian and Sons	680½	£3,809 2 0	9 Copper Miners' Co.	267½	£1,229 14 6
2 Freeman and Co.	216½	1,326 13 1	10 Charles Lambert	157½	645 0 3
3 Grenfell and Sons	424½	2,160 14 4	11 Newton, Keates & Co. ...		
4 Crown Copper Co.*			12 Sweetland, Tuttle & Co. ...	310	764 15 0
5 Sims, Williams & Co.	332½	1,943 1 8	13 Penclawdd Copper Co. ...	35	193 7 6
6 Williams, Foster & Co.	476½	2,973 4 8			
7 Mason and Elkington ...	395	1,543 1 0	Total	3,472	£17,135 12 0
8 Bankart and Sons	176	546 13 0			

Average Produce, 6½.
Quantity of Fine Copper, 215 tons 11 cwts.Average Standard£123 16 0
Average Price per ton 4 19 0

* The purchases made by No. 4 (Crown Copper Co.) are included in the total of No. 6 (Williams, Foster & Co.), those firms being identical.

Copper Ores.

Sampled April 20, and sold at Tyack's Hotel, Camborne, May 5.

Mines	Tons.	Pur-chasers.	Price.	Mines	Tons.	Pur-chasers.	Price.
Clifford Amalgamated	86	9	£4 9 0	North Roskear	82	3	£12 0 6
	84	12	4 1 6		44	13	7 5 6
	78	7	3 11 0		29	9	2 5 6
	74	10	3 11 0	(Pendarves)	39	5	4 9 0
	72	11	5 5 0	Tolcarne	51	1, 7	5 16 6
	69	1	10 17 6		46	7	4 3 6
	64	9, 11	5 2 6		41	7	2 2 0
	62	3	10 16 6		39	1	5 12 0
	61	1	10 15 0	Wheal Basset	38	1	5 9 6
	50	1	3 4 6		57	5	5 5 6
	36	2	9 8 6		30	1, 2	9 10 6
West Seton	73	3	5 13 0	South Frances	40	2, 5, 6	6 18 0
	65	3, 10	5 9 0		38	8	4 15 0
	64	10	4 11 0		31	4, 5, 6	6 3 6
	54	3	6 16 0	North Crofty	58	10	1 7 0
	53	10	3 0 6		39	5	7 1 0
	52	3	8 3 0	East Basset	35	5	5 2 6
	33	3	10 2 6		33	1, 5	11 14 6
Wheal Seton	21	12	1 4 6		24	5	3 19 0
(Pendarves)	95	2	5 5 0	New Treleigh	70	12	3 4 6
	86	7	4 1 0		16	9	0 7 6
	72	9	5 8 6	Nanjiles	36	1	6 18 6
	50	7	6 0 0		23	7	2 17 0
	22	7	14 11 6		19	7	3 4 0
	5	7	3 3 6	Wheal Grenville	29	1	5 12 6
South Tolgus	63	10	3 7 0		28	1	6 19 6
	54	5	5 19 6	East Grenville	44	5, 10	3 2 0
	53	8	3 12 6		3	1	1 15 0
	51	3	5 16 0	Wheal Harriett	37	1	3 16 6
	44	3, 5, 7	8 6 0	West Stray Park	31	7	5 16 6
East Pool	65	1	0 6 6	Tresavean	25	8	2 8 0
	64	10	4 0 6	Crane	9	1, 5	9 2 6
	61	9, 10	3 16 0		7	1, 5	5 0 0
	50	10	3 18 6				

TOTAL PRODUCE AND VALUE.

Tons.	Amount.	Tons.	Amount.
Clifford Amalgamated	786	£4,548	8 6
West Seton	394	2,343	7 0
Wheal Seton	351	1,899	18 0
South Tolgus	265	1,386	16 6
East Pool	240	706	15 6
North Roskear	194	1,545	13 6
Tolcarne	177	793	12 6
Wheal Basset	175	1,068	4 6
South Frances	109	647	18 6
North Crofty	97	353	5 0
East Basset	92	£661	2 0
New Treleigh	86	231	15 0
Nanjiles	78	375	13 0
Wheal Grenville	57	358	8 6
East Grenville	52	150	8 0
Wheal Harriett	37	141	10 6
West Stray Park	31	180	11 6
Tresavean	25	60	0 0
Crane	16	117	2 6

EACH COMPANY'S PURCHASE.

Tons.	Amount.	Tons.	Amount.
1 Vivian and Sons	575	£3,595	7 9
2 Freeman and Co.	159½	1,072	18 6
3 Grenfell and Sons	454½	3,789	8 8
4 Crown Copper Co.*	—	—	—
5 Sims, Wiliams & Co.	332½	1,943	16 4
6 Williams, Foster & Co.	34	219	12 4
7 Mason and Elkington	441½	2,117	1 5
8 Bankart and Sons	116	432	12 6
9 Copper Miners' Co.	265½	£1,125	3 6
10 Charles Lambert	511	1,818	13 0
11 Newton, Keates & Co.	104	542	0 0
12 Sweetland, Tuttle & Co.	175	593	15 6
13 Penclawdd Copper Co.	44	320	2 0
Total	3,212	£17,570	10 6

Average Produce, 6½.
Quantity of Fine Copper, 220 tons 8 cwt.

Average Standard £119 16 0
Average Price per ton 5 9 6

* The purchases made by No. 4 (Crown Copper Co.) are included in the total of No. 6 (Williams, Foster & Co.), those firms being identical.

Copper Ores.

Sampled April 27, and sold at Tabb's Hotel, Redruth, May 12.

Mines.	Tons.	Purchasers.	Price.	Mines.	Tons.	Purchasers.	Price.
Wheal Margery.....	74	1, 4, 6	£1 19 6	Levant	2	8	£9 8 0
	86	4, 6	2 2 6	Treloweth	83	5	2 19 0
	62	12	2 9 6		58	5	4 9 6
	61	1, 6	6 6 6		34	1, 6, 7	13 8 6
	60	6	6 3 6	Tolvadden	58	1, 7, 8, 10	4 9 6
	57	1	2 6 0		53	6	2 19 6
West Basset	87	6	5 4 8		49	6	5 8 0
	73	6, 10	4 2 0		8	7	14 7 0
	60	2	8 16 0	East Rosewarne	49	7	8 16 0
	47	1	10 11 6		37	1, 6	13 2 6
	39	10	4 7 6		30	7	7 1 0
	35	1	9 8 6		23	6	9 0 0
	17	2	13 3 6		16	7	2 9 6
East Carn Brea	59	7	4 1 6	Copper Hill	44	10, 12	2 0 6
	55	7	4 1 6		43	10	2 9 6
	51	10	4 2 6		39	6	11 17 6
	46	13	5 3 6	Par Consols	90	1, 6	6 18 0
	40	13	4 12 0	Botallack	33	1, 6	7 13 6
	38	9, 11	4 3 6		32	1, 6	4 4 6
	35	4, 6, 7	4 17 6	Wheal Buller.....	56	9	3 13 0
	32	9, 10	1 15 6	North Frances	25	5	4 8 0
Prosper United.....	113	1	1 15 0	Allen's Ore	18	1	8 8 6
	73	4, 6	4 19 6	North Basset.....	17	10	5 7 6
	69	4, 6, 10	2 18 6	Wh. Emily Henrietta	17	10	7 12 0
	44	5	3 6 6	Great Wheal Alfred..	16	5	3 14 6
	25	2	5 18 0	Alfred Consols	16	2	6 1 6
Levant	76	6	5 14 0	Crowan Consols	9	1	3 8 6
	44	1	5 1 6		4	1	3 0 0
	40	6	5 5 6	South Crenver	4	12	1 7 6
	39	1	1 6 6				

TOTAL PRODUCE AND VALUE.

	Tons.	Amount.		Tons.	Amount.
Wheal Margery	390	£1,327 5 6	Botallack	65	£388 9 6
West Basset	358	2,503 7 6	Wheal Buller	56	204 8 0
East Carn Brea	356	1,483 1 0	North Frances	25	110 0 0
Prosper United	324	1,056 11 0	Allen's Ore	18	151 13 0
Levant	201	937 19 6	North Basset.....	17	91 7 6
Treloweth	175	960 17 0	Wheal Emily Henrietta...	17	129 4 0
Tolvadden	168	796 12 6	Great Alfred.....	16	59 12 0
East Rosewarne	155	1,374 18 6	Alfred Consols	16	97 4 0
Copper Hill	126	658 13 0	Crowan Consols	13	42 15 6
Par Consols	90	621 0 0	South Crenver	4	5 10 0

EACH COMPANY'S PURCHASE.

	Tons.	Amount.		Tons.	Amount.
1 Vivian and Sons	543	£2,831 8 4	9 Copper Miners' Co. ...	91	£312 2 6
2 Freeman and Co.	118	996 13 6	10 Charles Lambert.....	279	1,062 15 3
3 Grenfell and Sons	—	—	11 Newton, Keates & Co.	19	79 6 6
4 Crown Copper Co.*	—	—	12 Sweetland, Tuttle & Co.	88	203 10 0
5 Sims, Wilyams & Co. ...	226	820 6 0	13 Penclawdd Copper Co.	96	422 1 0
6 Williams, Foster & Co. ...	859	4,653 1 11			
7 Mason and Elkington ...	254½	1,535 11 3	Total.....	2,580	£13,000 10 0
8 Bankart and Sons	16½	88 13 9			

Average Produce, 6½.

Quantity of Fine Copper, 163 tons 19 cwts.

Average Standard

Average Price per ton

Black Tin Sales.

Dates.	Mines.	Tons. c. q. lbs.	Price per ton.	Purchasers.	Amount of Money.
			£ s. d.		£ s. d.
April 20. Pedn-an-drea United	9 14 3	21	—	Trethellan.....	609 16 0
" 23. Prosper United	4 19 3	20	63 0 0	Mellaneur	388 0 10
" "	1 8 2	26	51 0 0	ditto	
" 28. Gurlyn	3 8 2	14	61 0 0	Chyandour	209 6 0
" "	4 1 1	24	64 0 0	ditto	250 13 6
" 30. St. Day United	32 16 2	1	—	"	1,856 5 3
" "	44 12 2	25	—	"	2,829 15 0
May 2. North Jane	1 18 2	1	60 0 0	Daubuz & Co.	115 10 6
" "	4 17 1	0	65 15 0	Truro Co.	319 14 2
" 5. Prosper United	3 7 0	15	63 10 0	Mellaneur	258 17 0
" "	0 17 2	9	52 0 0	ditto	
" 7. Phenix	11 18 1	12	55 12 6	Bissee Co.	662 18 7
" 14. Great Wheal Vor	51 6 0	8	—	"	3,423 9 1
" Pedn-an-drea United	8 16 3	20	—	Carvedras	531 15 8

* The purchases made by No. 4 (Crown Copper Co.) are included in the total of No. 6 (Williams, Foster & Co.), those firms being identical.

Copper Ores.

Sampled May 4, and sold at the Royal Hotel, Truro, May 19.

Mines.	Tons.	Pur- chasers.	Price.	Mines.	Tons.	Pur- chasers.	Price.
Devon Great Consols	140	10	£4 18 0	Hingston Down	87	9	£3 0 0
	136	7	5 9 0		86	10	2 7 6
	135	10	4 7 6		82	1, 5	3 0 0
	130	11	6 3 6		70	9, 11	4 12 0
	129	1	6 5 0		68	7	3 11 6
	124	4, 6	5 4 0		49	2	8 17 6
	122	9, 10	5 1 0	Marke Valley	95	4, 6	3 10 0
	119	9	4 14 6		94	4, 6	3 10 0
	117	3	5 0 0		84	4, 6, 10	2 5 0
	115	1, 3	4 3 6		40	1	1 7 6
	107	5	6 5 0		39	3	5 4 0
	106	1	5 9 6		27	10	1 12 0
	97	3	5 18 0	East Russell	26	3	2 6 0
	95	6	4 4 6		85	5	4 11 0
	84	2, 8	3 9 0		61	5	4 7 0
	71	1, 6	8 12 6		44	12	3 11 6
	59	5	2 7 6	Bedford United	34	12	3 19 0
	57	1, 6	15 17 0		101	4, 6	4 12 6
	22	13	8 7 6		99	4, 6	4 3 6
	21	2	4 11 0	Wheal Friendship	70	1, 10, 12	2 12 6
	17	5	2 16 0		50	4, 6	11 12 6
New Wheal Martha...	99	1, 5	2 7 6		39	4, 6	8 18 0
	95	1, 5	0 18 6	Wheal Emma	58	2, 10	1 18 0
	81	1, 5	1 12 6		56	2	3 7 6
	80	1, 5	2 11 0		26	2	5 1 6
	79	1, 5	1 16 6	Wheal Crebor	71	2, 10	4 12 0
	75	1, 5	1 18 0		52	8	2 15 0
	69	1, 5	2 0 0	Wheal Edward	44	9	1 12 0
	66	1, 5	2 12 6		40	9, 12	3 5 0
	35	1, 5	2 12 6	Kelly Bray	51	10	2 3 6
East Caradon	90	9	4 5 6		19	2	3 12 0
	85	12	4 2 6	Lady Bertha	65	4, 6, 10	2 5 6
	83	5	6 16 0	Calstock Consols	56	1	3 3 6
	82	10	3 11 6	Fursdon	27	12	4 0 6
	68	1, 6	11 16 6	Hawkmoor	24	2, 7	4 9 0
	57	1, 2	6 8 6	Collacombe	22	1	2 12 0
	27	1	19 9 0	East Wheal Florence	20	2	4 3 0

TOTAL PRODUCE AND VALUE.

	Tons.	Amount.		Tons.	Amount.
Devon Great Consols...	2,007	£11,024 17 0	Wheal Crebor	123	£469 12 0
New Wheal Martha ...	679	1,348 8 6	Wheal Edward	84	200 8 0
East Caradon	490	3,264 15 0	Kelly Bray	70	179 6 6
Hingston Down	442	1,711 4 6	Lady Bertha	65	147 17 0
Marke Valley	405	1,211 6 0	Calstock Consols	56	177 16 0
East Russell	224	909 14 0	Fursdon	27	108 13 6
Bedford United	200	890 9 0	Hawkmoor	24	106 16 0
Wheal Friendship	159	1,113 1 6	Collacombe	22	57 4 0
Wheal Emma	140	431 3 0	East Wheal Florence	20	83 0 0

EACH COMPANY'S PURCHASE.

	Tons.	Amount.		Tons.	Amount.
1 Vivian and Sons	951	£4,616 7 7	9 Copper Miners' Co.	356	£1,812 9 6
2 Freeman and Co.	340	1,609 9 9	10 Charles Lambert	751	2,757 8 8
3 Grenfell and Sons	336	1,659 19 3	11 Newton, Keates & Co.	165	963 15 0
4 Crown Copper Co.*	—	—	12 Sweetland, Tuttle & Co.	234	843 3 0
5 Sims, Williams & Co.	776	2,855 10 10	13 Penclawdd Copper Co.	22	184 5 0
6 Williams, Foster & Co.	893	4,890 13 5			
7 Mason and Elkington	216	1,037 14 0	Total	5,237	£23,425 12 0
8 Bankart and Sons	96	294 16 0			

Average Produce, 5½.
Quantity of Fine Copper, 294 tons 2 cwt.

Average Standard £128 12 0
Average Price per ton 4 9 6

* The purchases made by No. 4 (Crown Copper Co.) are included in the total of No. 6 (Williams, Foster & Co.), those firms being identical.

Copper Ores.

Sampled March 30, and sold at Swansea, May 3.

Mines.	Tons.	Pro-duce.	Pur-chasers.	Price.	Mines.	Tons.	Pro-duce.	Pur-chasers.	Price.
Moonta	106	26	7	£22 11 6	Del Soto.....	86	21	1	£18 4 0
98	23	7	20	7 6	6	13	7	11	9 0
56	19	7	16	16 6	1	28	5	24	3 0
17	23	7	20	1 0	Wallaroo	6	9	7	8 2 6
63	11	7	9	12 6	Cape Copper.....	94	31	2, 7	27 12 0
Knockmahon ...	85	11	5	9 12 0	41	26	13	22	17 0
95	9	5	7	19 0	68	31	5, 6	27	13 0
89	9	13	8	2 6	60	32	3, 6	28	1 0
130	12	1, 13	10	1 6	76	26	3	23	0 0
Fortune Copper)	67	13	3, 6	11 12 0	13	36	10	31	13 6
(W.A.).....	57	14	6	11 12 0	20	22	10	19	11 6
Connorree Ore ...	63	3	13	2 5 6	8	34	2	30	10 0
45	3	13	2	5 6	7	30	6	26	12 0
Leghorn	43	9	3	7 16 0	1	28	10	23	10 6
41	9	3	7	17 0	1	41	5	34	1 0
19	10	3	9	0 0	13	28	5	24	18 0
Cappagh	20	8	6	11 0	Cuba (Maritua) ..	97	9	6	7 13 0
10	18	6	15	17 0	90	8	1, 10	7	2 6
5	13	6	10	19 0	69	8	1	7	0 0
Wallaroo	49	9	1	8 1 6	46	7	1	6	6 0
41	9	1	8	1 6	Regulus	14	16	10	13 3 6
Burnt Ore	106	5	2, 7	4 4 0	Precipitate.....	3	65	5	54 1 0
British Regulus...	32	14	6	12 6 0	Regulus	1	40	5	34 10 0

TOTAL PRODUCE AND VALUE.

Tons.	Amount.	Tons.	Amount.
Moonta	34	£6,279	2 6
Knockmahon	399	3,604	2 6
Fortune Copper (W. A.)	124	1,438	8 0
Connorree Ore	108	245	14 0
Leghorn	103	828	5 0
Cappagh	35	344	5 0
Wallaroo.....	90	726	15 0
Burnt Ore	106	£445	4 0
British Regulus	32	393	12 0
Del Soto.....	93	1,658	1 0
Wallaroo	6	48	15 0
Cape Copper.....	400	10,401	18 0
Cuba (Maritua).....	320	2,537	4 0

EACH COMPANY'S PURCHASE.

Tons.	Amount.	Tons.	Amount.
1 Copper Miners' Co.	401	£4,040	5 0
2 Freeman and Co.....	108	1,763	16 0
3 Grenfell and Sons	337	4,561	12 0
4 Crown Copper Co.	—	—	—
5 Sims, Williams & Co.	124	1,983	6 0
6 Vivian and Sons	337	4,793	11 0
7 Williams, Foster & Co.	452	7,916	7 6
8 British and For. Copper Co. —	—	—	—
9 Mason and Elkington ...	—	—	—
10 Bankart and Sons	93	£1,331	17 6
11 Charles Lambert	—	—	—
12 Ravenhead Copper Co. ...	—	—	—
13 Sweetland, Tuttle & Co. 303	—	2,560	11 0
14 Jennings & Co.	—	—	—
Total	2,156	£28,951	6 0

Sundry Copper Ore Sales.

Dates.	Mines	Tons.	Price per ton.	Purchasers.	Amount of Money.
April 20.	Great Laxey (ex John James)	45	£ 4 4 8	James Radley.....	—
" 29.	" (ex Black Diamond)	36	4 16 8	ditto	1,364 10 0
May 2.	Knockmahon (ex Brothers) ...	85	10 12 6	Henry Baxter	—
"	"	32	4 7 6	ditto	1,187 10 0
"	"	32	4 7 6	Bibby, Sons, & Co. ...	—
"	Brynfeelin (ex E. Blake)	65	2 16 0	C. Lambert	182 0 0
" 16.	Cape Copper Co. (ex May)	25	25 7 0	Vivian & Sons	—
"	"	65	25 16 6	Newton, Keates, & Co.	—
"	"	60	25 7 0	Vivian & Sons	6,918 17 6
"	"	60	25 12 0	Newton, Keates, & Co.	—
"	"	60	25 16 6	H. Baxter	—
" 17.	Parys (copper ore)	155	6 8 6	Sims, Williams, & Co.	—
"	"	155	6 8 6	Mona Co.	—
"	(copper precipitate).....	48	13 1 0	ditto	2,980 14 0
"	"	32	8 8 0	ditto	—
"	"	50	1 17 6	ditto	—

Blende Sales.

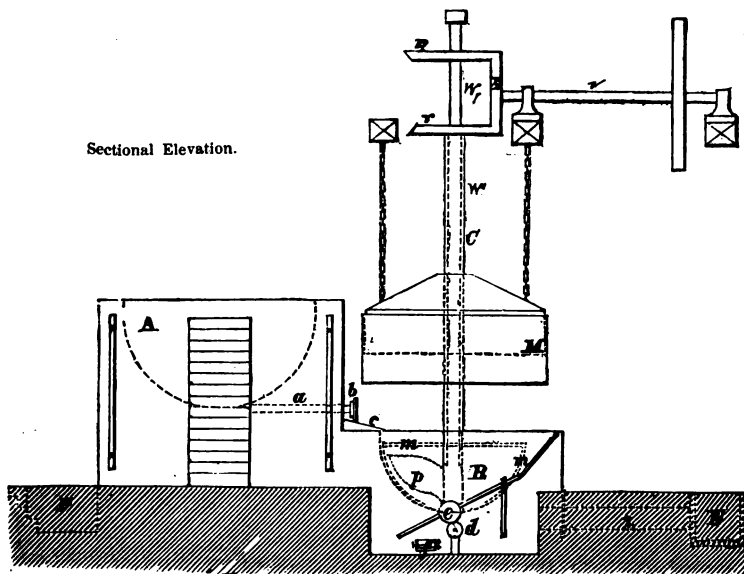
Dates.	Mines.	Tons.	Price per ton.	Purchasers.	Amount of Money.
May 6.	Minera	100	£ 4 16 0	Vivian & Sons	—
"	"	35	5 0 0	ditto	760 0 0
"	"	15	3 8 0	ditto	—
"	"	10	5 8 0	ditto	—

Lead Ore Sales.

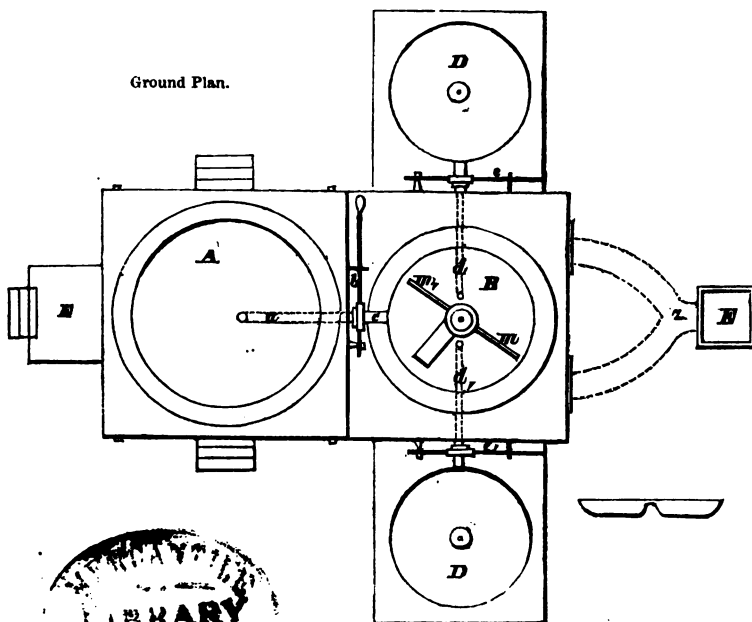
Dates.	Mines.	Tons.	Price per Ton.			Purchasers.	Amount of Money.
			£	s.	d.		£ s. d.
April 12.	Silver Mountain	21	14	5	0	Sims, Wiliyams & Co.....	299 5 0
" 22.	Cargoll	54	18	7	6	Panther Co.	1,116 7 6
	"	15	8	5	6	Treffry's Trustees.....	120 0 0
" 28.	Hendre Ucha	8	15	0	0	Newton, Keates & Co.	302 10 0
	Bryngwyn	20	15	2	6	Brymbo Co.	147 0 0
	East Pant Du	10	14	14	0	Newton, Keates & Co.	202 10 0
	Llanrwst	15	13	10	0	ditto	219 7 6
	Roman Gravels.....	15	14	12	6	Walker, Parker & Co.	164 9 0
	Dyfnwgwm	11½	14	6	0	Newton, Keates & Co.	565 3 6
	Llanerchyraur	37	15	5	6	Walker, Parker & Co.	75 7 6
" 29.	Cwmbrane	54	13	14	0	Sims, Wiliyams & Co.	1,236 15 0
May. 2.	East Logylas	85	14	11	0	Walker, Parker & Co.	1,611 0 0
	Glogfach	90	17	18	0	ditto	1,445 0 0
	Cwmystwith	50	14	7	6	Panther Co.	706 16 0
	"	50	14	10	6	ditto	139 5 0
" 3.	Dyliffe	48	14	14	6	Walker, Parker & Co.	227 5 0
	Nant-y-lago	10	13	18	6	ditto	2,750 0 0
	North Laxey	15	15	3	0	Mining Co. of Ireland.....	2,079 0 0
	Wheal Frank Mills	100	17	10	0	Treffry's Trustees.....	687 4 6
	"	70	14	5	0	Stock & Co.	26 7 0
	Maesysafn	140	14	17	0	—	3,168 15 0
	Talisker	77	8	18	6	Treffry's Trustees.....	2,536 0 0
	Aclare	2	13	3	6	ditto	1,502 10 0
" 5.	Fortune Copper Co.	250	12	13	6	—	240 3 9
" 6.	Isle of Man Mining Co.	100	25	7	0	Sims, Wiliyams & Co.	2,512 10 0
	Wheal Mary Ann.....	50	30	1	0	ditto	145 10 0
	Minera	100	14	18	6	Walker, Parker & Co.	150 15 0
	"	100	14	18	6	ditto	44 12 6
	"	50	14	18	6	ditto	103 15 6
	"	50	14	18	6	Brymbo Co.	269 2 0
	"	50	14	19	0	Sims, Wiliyams & Co.	705 7 6
	"	50	14	19	0	Brymbo Co.	297 10 0
	"	46	15	0	0	ditto	95 11 0
	"	105	14	18	6	Walker, Parker & Co.	281 0 0
	"	105	14	18	6	ditto	30 1 0
	South Foxdale	15½	15	5	0	ditto	160 17 6
" 11.	Great Laxey	100	25	2	6	Mitchell & Son	174 17 6
" 12.	Talargoch (Maesyrerwddu) ..	26½	15	12	6	A. Eyton	71 12 6
	" (Coetia Liys) ..	26½	15	12	6	Walker, Parker & Co.	343 12 3
	" ..	78½	16	4	0	Newton, Keates & Co.	55 12 0
	" ..	24	15	0	0	Walker, Parker & Co.	250 0 0
	Deep Level	10	14	11	0	A. Eyton	597 0 0
	Brynford Hall	5	15	1	6	Newton, Keates & Co.	728 9 3
	" ..	5	15	1	6	Walker, Parker & Co.	104 10 0
	Lixwm	3	14	17	6	ditto	1,719 4 0
	Rhosesmor	7	14	16	6	A. Eyton	159 0 0
	Parry's	18	14	19	0	ditto	1,306 17 6
	Bryn Gwlog	45	15	13	6	Walker, Parker & Co.	1,150 7 6
	Long Rake	20	14	17	6	A. Eyton	925 7 0
	Speedwell	7	13	13	0	ditto	
	North Henblas	20	14	1	0	Newton, Keates & Co.	
	Chware Las	2	15	0	6	Walker, Parker & Co.	
	Pennant	11	14	12	6	ditto	
	Dog Pit	13	13	9	0	A. Eyton	
	Trelogan	3	14	8	6	ditto	
	" ..	2	14	3	6	ditto	
	Llangynog United	24½	14	0	6	Walker, Parker & Co.	
	Aberdovey	4	13	18	0	Newton, Keates & Co.	
	Caeconroy	16	15	12	6	ditto	
	Dyliffe	40	14	18	6	A. Eyton	
	Havan	50½	14	8	6	Newton, Keates & Co.	
	Cwmsymlog	5	20	18	0	Sims, Wiliyams & Co.	
" 16.	Frongoch	96	14	5	0	ditto	
	" ..	96	14	1	6	Panther Co.	
	West Frongoch	24	13	5	0	ditto	
	East Darren	75	17	8	6	A. Eyton	
	Cwm Erfin	35	17	7	6	Panther Co.	
	" ..	30	18	1	6	J. & J. Williams	
" 18.	Dyliffe	62	14	18	6	A. Eyton	

FRENCH MECHANICAL APPARATUS FOR WORKING PATTINSON'S PROCESS.

Sectional Elevation.



Ground Plan.



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